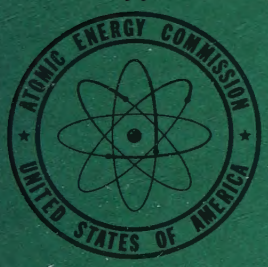
UNITED STATES ATOMIC ENERGY COMMISSION

Nuclear Science Abstracts

Vol. 6 No. 3

Abstracts 756-1064

Feb. 15, 1952



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Indexes

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PRINTED IN U.S.A.
PRICE 25 CENTS

The printing of this publication has been approved by the Director of the Bureau of the Budget, August 2, 1951.

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DEVELOPMENT OF HIGH-TEMPERATURE MAGNESIUM ALLOYS WITH SPECIFIED NEUTRON CROSS SECTION (Final Technical Report); by [T. E. Leontis]. July 19, 1951. 36p. (NP-3535)

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NOTES ON A TOUR OF AMERICAN FIXED-FREQUENCY CYCLOTRONS IN THE AUTUMN OF 1950; by J. W. Gallop. [nd] 116p. (NP-3537; Library No. 533)

NP-3544 787
COLLECTION OF REPRINTS ON RADIUM POISONING; by Harrison S. Martland, reprinted by Technical Information Service, AEC. 1925-1939. 193p. (NP-3544)

NP-3545 904
British Aluminium Co., Ltd., London (England)
LIGHT METALS BULLETIN; VOL. 12, NO. 10, 1950. May 12, 1950. 46p. (NP-3545; F²-4358-50; R-1585-50)

NRL-3870 885
Naval Research Lab.
PREPARATION OF SILICONE COMPOUNDS FOR USE IN HIGH-TEMPERATURE ORGANIC FINISHES; by W. E. Weaver. Oct. 31, 1951. 25p. (NRL-3870)

NRL-3897 946
Naval Research Lab.
THE ELECTROLYTIC SEPARATION OF LITHIUM ISOTOPES FROM MOLTEN SALT; by J. I. Hoover and G. E. Holloway. Nov. 2, 1951. 9p. (NRL-3897)

PORTON-552 756
[Ministry of Supply (Great Britain)]
THE PRESENT POSITION OF THE THEORY OF EDDY-DIFFUSION IN RELATION TO PROBLEMS OF CHEMICAL WARFARE; by N. K. Johnson. Jan. 20, 1928. 4p. (PORTON-552)

PORTON-2474 938
[Ministry of Supply (Great Britain)]
WIND VELOCITY PROFILE IN THE LOWER ATMOSPHERE; PART I. THE VERTICAL WIND GRADIENT APPARATUS; by E. L. Deacon. Feb. 16, 1943. 31p. (PORTON-2474; Reference Item 19(a) Note M-212)

PORTON-Memo-6 757
[Ministry of Supply (Great Britain)]
THE METEOROLOGY OF CHEMICAL WARFARE (Memorandum); by E. L. Davies. [nd] 80p (PORTON-Memo-6)

RPR-119 939
Radiophysics Lab., Univ. Grounds, Sydney (Australia)
AUTOMATIC COMPUTATION; THE DESIGN OF THE MK. 1 AUTOMATIC COMPUTER; by T. Pearcey. June 1951. 65p. (RPR-119)

RPR-120 940
Radiophysics Lab., Univ. Grounds, Sydney (Australia)
AUTOMATIC COMPUTATION; PART II. PROGRAMMES FOR AN AUTOMATIC COMPUTER; by T. Pearcey. July 1951. 37p. (RPR-120)

TEM-149 764
Geological Survey
PHYSICAL AND CHEMICAL COMPARISON OF MODERN AND FOSSIL TOOTH AND BONE MATERIALS; by Elizabeth B. Jaffe and A. M. Sherwood. Aug. 1951. 19p. (TEM-149)

U-13983 876*
Cornell Aeronautical Lab., Inc.
A RECORD OF CONFERENCE, SPONSORED BY THE MATERIALS PANEL OF PROJECT SQUID, IN WASHINGTON, D. C. ON 24 MAY 1950 ON FATIGUE OF METALS AT HIGH TEMPERATURES; H. J. Yearian, comp., Philip K. Porter, ed. May 24, 1950. 178p. (U-13983; Technical Report No. 21)

GENERAL

ATOMIC BOMBS AND WARFARE

756

[Ministry of Supply (Great Britain)]

THE PRESENT POSITION OF THE THEORY OF EDDY-DIFFUSION IN RELATION TO PROBLEMS OF CHEMICAL WARFARE; by N. K. Johnson. Jan. 20, 1928. 4p. (PORTON-552)

The development of both the experimental and theoretical work carried out by the Meteorological Department, Porton, on diffusion of smoke clouds in the atmosphere is traced. The experiments leading to revision of the mathematical theory of eddy diffusion are summarized.

757

[Ministry of Supply (Great Britain)]

THE METEOROLOGY OF CHEMICAL WARFARE (Memorandum); by E. L. Davies. [nd] 80p (PORTON-Memo-6)

The researches on the meteorological aspects of chemical warfare, such as the diffusion of gases and smokes in the lower atmosphere, the persistence of liquids in the open, the screening power of smoke clouds, and the spraying of liquids from aircraft, which have been conducted at the War Department Experimental Station, Porton, are summarized. A method has been evolved whereby it is possible to obtain a reasonably accurate estimate of the rate of diffusion of gases and smokes from calculations based upon simple meteorological observations. A brief account of the salient features of surface meteorology is followed by a résumé of the mathematical theory, together with an account of the field trials which confirm, to a large extent, the calculations. The application of the diffusion theory to the problem of screening by smoke is straightforward, and a partial solution of the complex problem of evaporation has also been successfully tested. Finally, an account is given of investigations which are being made into the problem of forecasting for aerial sprays.

BIOLOGY AND MEDICINE

758

Harvard Univ. Medical School

FACTORS AFFECTING THE METABOLISM OF GLUCOSE AND PYRUVATE, IN VITRO; by A. Baird Hastings. Nov. 16, 1951. 14p. (AECU-1754)

Experiments on the effects of K on carbohydrate metabolism by rat liver in vitro showed that conditions which maintain the intracellular K concentration at its normal value favor glycogen formation from glucose and from pyruvate, and that a decrease in K concentration decreases glucose uptake (or disappearance) but enhances the conversion of pyruvate to glucose. A summary is given of experiments in progress on hormonal effects on glycogen formation from glucose and pyruvate.

759

Minnesota Univ.

FREE AMINO-ACIDS AND CARBOHYDRATES SYNTHESIZED BY USTILAGO ZEAE (abstract); by J. E. DeVay, J. B. Rowell, and E. C. Stakman. [nd] 1p. (AECU-1755)

The report comprises an abstract of a paper for the annual meeting of the American Phytopathological Society, Dec. 10–12, 1951, and is reproduced here in its entirety.

Chromatographic analyses showed that culture extracts from two compatible haploid lines and a solopathogenic line of Ustilago zeae contain glutamic acid, aspartic acid, serine, glycine, alanine, threonine, glutamine, lysine, arginine, gamma-amino butyric acid, proline, valine, leucine and /or isoleucine, phenylalanine, and tyrosine. An unknown ninhydrin-reacting compound, stable to hydrolysis, was found only in extracts from one haploid line. Another unknown was found only in extracts from the solopathogen. Quantitative variations among the amino acids were found when analyses of the three lines were compared. Young cultures contained relatively large amounts of glutamic acid; in older cultures other amino acids increased greatly. The presence of free amino acids was affected by the degree of culture aeration and culture age. Changes in the sugar content of aging cultures were followed by sugar chromatography of the amino-acid extracts. Maltose, sucrose, fructose, ribose, and six unidentified NH_3–silver nitrate reducing compounds were found. Cellobiose, arabinose, xylose, and rhamnose corresponded in R_f values on one-dimensional chromatograms to four of the six unknowns.

760

Lankenau Hospital Research Inst.

ACTIVATION OF PYRUVATE OXIDATION IN TUMOR MITOCHONDRIA BY DIPHOSPHOPYRIDINE NUCLEOTIDE; by Charles E. Wenner, Morris A. Spirtes, and Sidney Weinhouse; Lankenau Hospital Research Inst.; Institute for Cancer Research, Philadelphia; [and Temple Univ.] [nd] 14p. (AECU-1777)

Suspensions of mitochondria of various transplanted mouse tumors are able to oxidize pyruvic acid if the system, containing Mg ions, ATP, cytochrome C, and priming concentrations of fumarate, is fortified with diphosphopyridine nucleotide. The concentration of the nucleotide required for maximal activation is 0.002M. When mitochondria of tumors were compared with those of normal tissues it was found than on a per milligram nitrogen basis pyruvate oxidation was similar in magnitude in both types of mitochondria.

761

Lankenau Hospital Research Inst.

METABOLISM OF NEOPLASTIC TISSUE; II. A SURVEY OF ENZYMES OF THE CITRIC CYCLE IN TRANSPLANTED TUMORS; by Charles E. Wenner, Morris A. Spirtes, and Sidney Weinhouse; Lankenau Hospital Research Inst.; Institute for Cancer Research, Philadelphia; and Temple Univ. [nd] 21p. (AECU-1778)

A series of transplanted mouse and rat tumors was assayed for their content of citric acid cycle and related enzymes, and the results were compared with a represen-

tative series of normal tissues. Lactic, malic, and isocitric dehydrogenases, fumarase, oxalacetic carboxylase, and the "condensing" enzyme were found present in tumors in amounts comparable with normal tissues. Aconitase and α-ketoglutarate dehydrogenase were present in tumors but to lower extents than in normal tissues. The results warrant the conclusion that neoplastic tissues posses the enzymatic equipment for the citric acid cycle. (auth)

762

Los Alamos Scientific Lab.

STUDIES ON THE NUCLEOPROTEINS AND NUCLEIC ACIDS FROM PNEUMOCOCCUS TYPE VI; by Virgil L. Koenig, Louise Larkins, and J. D. Perrings. [Sept. 1951.] 24p. (AECU-1784; LADC-968)

The desoxyribonucleic acid and the ribonucleic acid have been prepared from pneumococcus type VI organism by a new barium-alcohol method which excludes deproteinization and treatment with enzymes. The yields are not high. It would seem that the nucleic acids exist as the free acids in the cells rather than as the nucleoproteins. If the nucleoproteins exist, the protein–nucleic acid combination is extremely weak. Sedimentation constants have been determined for the desoxyribonucleic acid and the ribonucleic acid at ten and seven different concentrations, respectively. The value of S_{20} at zero concentration was found to be 17.18 for desoxyribonucleic acid and 3.01 for ribonucleic acid. The average partial specific volumes determined at two concentrations for desoxyribonucleic acid and ribonucleic acid were 0.568 and 0.522, respectively, at 20°C. While extensive assay work was done to test the transforming potency of the desoxyribonucleic acid no success was had in arriving at good quantitative results. (auth)

763

Argonne National Lab.

DIVISION OF BIOLOGICAL AND MEDICAL RESEARCH; QUARTERLY REPORT, MAY, JUNE, JULY, 1951; by Austin M. Brues, ed. [nd] 112p. (ANL-4676)

Data are given on blood cell counts of guinea pigs having received bone-marrow injections before or after lethal x-ray doses. The prophylactic effect of bone-marrow injections against radiation injuries varies with the strain of mice. In 30-day LD_{50} comparisons of radon and x-radiation effects, the x-ray LD_{50} was 564 r with a standard deviation of 23 r or 52,400 ergs/g, the radon solution was 0.1415 ± 0.001 mc/g or 36,800 ergs/g. The energy absorbed from the x radiation was 1.42 times that of the particle energy. The biologic effects observed in mice injected intravenously with radon are caused 86% by α and 14% by β radiation. The histological changes in the retina of newborn mice due to 1000 r x radiation are illustrated; data are given on percentage of cataract formation and length of latent periods elapsing before these are visible. Information is given on the effects of spleen shielding during x radiation on blood cell counts, and effect of injection of embryonic suspensions, mashed placental tissues, and frozen spleen implants on sensitivity to x radiation. Spleen shielding of rabbits during irradiation with lethal x-ray doses preserved the capacity of forming antibodies, even though the spleen was removed 24 hr after irradiation and the antigen given 24 hr after splenectomy. Data on the effect of marrow suspensions from normal and estrogen-treated mice and of p-chloromercuribenzoate on the sensitivity of mice to total x irradiation are given. Supernatant plasmas of blood-perfused spleen of dogs were protective when injected in 1-ml dosage into mice immediately before giving the mice 800 r total-body x irradiation. The effects of massive doses of cortisone on mortality in the initial period following x irradiation of young chicks were small. In newly hatched chicks, the shielding of different small areas of the body during 1000 r x irradiation resulted in similar decreases in mortality, indicating that some lesions were effects of direct radiation. Renal failure was one of nymerous factors contributing to the deaths. Preparation of C^{14}-labeled dextran by biosynthesis is described. Effects of diethanolamine salt of maleic hydrazide on killer clones of Paramecium are reported. Studies with sea-urchin eggs and sperm showed inhibition of respiration of the cells when exposed to large doses of x radiation, the dose depending on the degree to which the cell is sensitive ti ionizing radiation, and increase of respirration after small doses. Some results of experiments of ionization in air from β-ray point sources are given. An ionization-type halide detector for use in quantitative measuring has been developed.

764

Geological Survey

PHYSICAL AND CHEMICAL COMPARISON OF MODERN AND FOSSIL TOOTH AND BONE MATERIALS; by Elizabeth B. Jaffe and A. M. Sherwood. Aug. 1951. 19p. (TEM-149)

Ten samples of manatee ribs and shark teeth from the land-pebble phosphate deposits of Florida are here compared chemically and physically to one Recent manatee rib collected in Florida waters. Experimental studies comparing the Recent bone with the fossil manatee bones revealed that the fossil bones have lost free carbonate and combustible organic matter, that they have gained in fluorine and ignited insoluble residue, and that some of the fossil bones have gained in U content. The refractive index, birefringence, and apparent homogeneity of the fossil bones are greater than those of the Recent bone. The x-ray diffraction pattern of the fossil bones matches a carbonate-apatite pattern; that of the Recent bone is a weak apatite-group pattern with diffuse lines. These variations indicate that some modification in the structure of the mineral matter of the bone has taken place during fossilization. (auth)

765

Atomic Energy Project, Univ. of Calif., Los Angeles

ORGAN BLOOD VOLUME MEASUREMENT IN NORMAL RATS; by Alvin E. Lewis, Raymond D. Goodman, and Edward A. Schuck. Issued Dec. 17, 1951. 16p. (UCLA-173)

By extracting Evans Blue and a hemoglobin derivative from homogenized tissues, using quantitative techniques, it is possible to measure organ blood volumes in the rat. Whereas the per cent of the total blood volume found in each organ shows considerable variation, the organ blood volume per gram of tissue is relatively constant for each respective organ. The difference between the organ hematocrit and the average venous hematocrit was determined for each organ. These data are in general agreement with investigations of blood volume obtained by other methods and are not dependent upon the use of radioactive tracers. In quantitative studies which investigate the tissue distribution of blood-borne substances, a correction for the organ blood volume can be made. (auth)

766

A METHOD FOR MAKING ULTRA-THIN TISSUE SECTIONS FOR ELECTRON MICROSCOPY AT HIGH RESOLUTION. Fritiof Sjostrand. Nature 168, 646-7(1951) Oct. 13.

To obtain sufficiently thin sections for electron microscopy at high resolution, double sectioning is used. Sections sliced to 0.5-1 μ are reimbedded on optically parallel glass, and the greater part of the thickness of these is then cut away and discarded.

767
PROPERTIES OF MUTANTS OF DROSOPHILA MELANOGASTER AND CHANGES DURING DEVELOPMENT AS REVEALED BY PAPER CHROMATOGRAPHY. Ernst Hadorn and Herschel K. Mitchel. Proc. Natl. Acad. Sci. U. S. 37, 650-65(1951) Oct.

A very simple and rapid procedure has been described for chromatographic analyses of fluorescent and ninhydrin-positive substances in Drosophila melanogaster. Single animals provide, after chromatography, quantities of four of the fluorescent compounds sufficient to allow quantitative photofluorometric measurements of relative concentration. The method, as applied to the animals at different stages in development, has revealed striking changes in the concentrations of fluorescent substances and in the concentrations of certain peptides. Several of the fluorescent compounds present in normal adult flies appear to be related genetically and biochemically to the red eye pigment. This conclusion is based on the fact that several of the fluorescent substances are either greatly reduced in concentration or are accumulated in mutants that drastically affect the formation of the red component of the eyes. Sex differences are described and the locations of the fluorescent compounds and ninhydrin-positive materials in various organs and body parts are given. The demonstrated accumulation of ninhydrin-positive substances in the larvae of the lethal mutant ltr, when correlated with the low protein concentration previously observed, suggests that this mutation affects protein metabolism. (auth)

RADIATION EFFECTS

768
A SUGGESTED CHAIN PROCESS FOR RADIATION DAMAGE. A. T. Reid and H. G. Landau. Bull. Math. Biophys. 13, 153-61(1951) Sept.

A mechanism by which transmission of the initial radiation damage, causing ionization in a sensitive volume due to absorption of radiation quanta, may take place, and a finite Markov chain model applicable to this transmission are postulated and discussed. This mechanism is assumed to be the depolymerization of essential chain molecules which are connected to some "central group" associated with the sensitive volume. The depolymerization of the macromolecules following a hit in the sensitive volume is postulated to be determined by a chain mechanism, which acts in a manner inverse to the mechanism controlling the polymerization process. A mathematical study of this problem is made, using the theory of Markov chains. The probability of complete degradation of the chain macromolecule and the probability of recombination of the units to give the intact chain were determined, assuming that the probability of successive steps in the degradation increases linearly from the intact state to that of complete breakdown.

769
THE GENETIC BASIS OF X-RAY INDUCED RECESSIVE LETHAL MUTATIONS. Irwin H. Herskowitz. Genetics 36, 357-63(1951) July.

Several hypotheses concerning the origin of x-ray induced recessive lethals are discussed. It is found that those postulating a single, or even a double, origin for recessive lethals are not consistent with the available data and theory. An hypothesis is suggested that recognizes lethals arising from three origins: point mutation, independent of breakage; breakage alone; and position effect following rearrangement of breaks. When the number of X chromosome break-free point mutation lethals in 100 viable sperm per 1000.r is assumed to be 0.6, the chance for a break not involved in gross rearrangement to bear a lethal 23 per cent, and the chance for lethality for a break included in a viable gross rearrangement 31.6 per cent, the number of breaks involved corresponds to the number postulated by Haldane and Lea (J. Genetics 48, 1-10(1947)) for different doses, and a linear increase in recessive lethals with dose is obtained for viable sperm. (auth)

770
X-RAY INDUCED LETHAL MUTATIONS IN SEVERAL STRAINS OF DROSOPHILA MELANOGASTER. Öistein Strömnaes. Hereditas 37, 532-59(1951).

Males from 31 strains of Drosophila melanogaster were tested in regard to their sensitivity to the induction of dominant lethal mutations by 2300-r x rays. Genetic differences in the sensitivity to induction of dominant lethal mutations by x rays were found to exist between unrelated strains.

771
THE LETHAL EFFECTS OF RADIATION. Edward Spoerl. Sci. American 185, 22-5(1951) Dec.

The physical and chemical events produced in living cells by ionizing radiations are reviewed. The text is illustrated with diagrammatic drawings depicting radiations and their effects upon cells.

772
EFFECT OF RADIANT ENERGY ON THE GONADOTROPIC FACTOR OF THE ANTERIOR LOBE OF THE HYPOPHYSIS. L. A. Kashchenko. Doklady Akad. Nauk S.S.S.R. 77, No. 1, 157-60(1951) Mar. 1. (In Russian)

Anterior pituitary hormone extract was exposed to 30,000 to 1,034,000 r of x radiation, to 0.022 to 35.00 mcd of radium β radiation, or to ultraviolet light. Changes in gonadotropic activity are tabulated. Activity changes on up to 90-days storage following the 100,000-r x irradiation also are listed.

773
SPONTANEOUS AND X-RAY INDUCED GYNANDROMORPHS IN DROSOPHILA MELANOGASTER. G. Bonnier and K. G. Luning. Hereditas 37, 470-87(1951).

Experimental production of gynandromorphs after x-ray irradiation of male and female Drosophila melanogaster is reported.

774
ACCUMULATION OF ANTHRANILIC ACID BY A MUTANT OF MAIZE. H. J. Treas and E. G. Anderson. Pro. Natl. Acad. Sci. U. S. 37, 650-65(1951) Oct.

A mutant of maize is described in which seedling leaves and anthers of the mature plant fluoresce blue in ultraviolet light. Anthranilic acid has been identified as one of the substances responsible for the blue fluorescence. The mutant, due to a single gene, is expressed as a recessive character in the seedling and as a dominant in the anthers. (auth)

775
CHANGES IN THE WHITE BLOOD COUNT AND THE URINARY EXCRETION OF LIPID-SOLUBLE REDUCING SUBSTANCES FOLLOWING RADIUM APPLICATION IN CASES OF CANCER OF THE UTERUS. S. Parviainen and P. O. Pärnänen. Ann. med. exptl. et biol. Fenniae 28, 135-42(1950).

In studies on the effect of Ra application on the activity of the adrenal cortex in patients with cancer of the uterus, decrease of excretion of reducing substances was found during Ra application, and temporary increase on the day following treatment. The number of all leucocytes rises immediately after radium application, while the eosinophils and, in general, the lymphocytes decrease in number. Great individual variations are to be noted on the following days. Radium application greatly reduces the excretion of

urine and always increases the concentration of reducing substances in the urine.

776

HORMONE-SECRETING TRANSPLANTABLE NEOPLASMS OF THE PITUITARY INDUCED BY I^{131}. J. Furth and W. T. Burnett, Jr. Proc. Soc. Exptl. Biol. Med. 78, 222-4(1951)

Pituitary growths induced by thyroid destructive doses of I^{131} are readily transplantable in mice whose thyroid glands had been similarly destroyed, but not in normal mice. These growths discharge gonadotropic hormones which in turn stimulate the production of gonadal hormones. Discharge of thyrotropic hormones by these tumors is assumed but remains to be demonstrated. On the basis of observations made it is postulated that the growths of the pituitary induced by thyroid-destroying quantities of I^{131} are conditioned neoplasms formed by cells which are driven to proliferation through the stimulus created by the absence of TH; the same chromophobe pituitary cell can discharge both gonadotropic and thyrotropic hormones. (auth)

777

ON THE INTERPRETATION OF THE DOSE-FREQUENCY CURVE IN RADIOGENETICS. R. A. Wijsman. Genetics 36, 478-87(1951) Sept.

Comparison of curves of multiple-event models with the curve for a single-event model supports the theory that a linear relationship between mutation frequency and radiation dose is caused by a single event. An exception has to be made for the possibility that some events may occur with much higher probability than any of the others, in which case a multiple-event model could give rise to a single-event type curve; this case is physically unlikely. Opatowski's curve (Bull. Math. Biophys. 12, 19-26(1950)) is shown to represent a one-event mechanism, and his conclusion that a many-event theory can give rise to a linear curve is unjustified.

778

RADIATION HEMOLYSIS, A CONTRIBUTION TO OUR KNOWLEDGE OF BIOLOGICAL EFFECTS OF IONIZING RADIATION. Bruno Lindemann. Fortschr. Gebiete Röntgenstrahlen 75, 523-59(1951) Nov. (In German)

Electron-optical analyses were made of the structure of x-irradiated erythrocytes. Numerous illustrations of normal erythrocytes and erythrocytes in the process of hemolysis are given and the mechanism of the effect of x radiation causing hemolysis of erythrocytes is discussed. It is concluded that x radiation caused osmotical hemolysis of erythrocytes by alteration of the permeability of the erythrocyte membrane due to primary denaturation. Three factors of speed regulate the process of x-ray hemolysis, the reaction between hemolyticum and cell membrane, the penetration of the salt, and the disintegration of the cellular contents into a diffusible mass, the latter playing a decisive part. Morphologically analogous alterations of the membrane are caused by acid and x-ray denaturation. Degree of hemolysis depends on presence and amount of blood plasma in the suspension; it seems, therefore, that denaturation of the erythrocyte membrane is caused by indirect effects of x rays. The age of the individual erythrocytes and a protective effect by aggregation of cells influence the physiological degree of scatter in the reaction by an irradiated suspension of erythrocytes.

RADIATION HAZARDS AND PROTECTION

779

Cancer Research Inst., New England Deaconess Hospital

A SURVEY OF ROENTGEN RAY EXPOSURES RECEIVED BY PERSONNEL IN SEVERAL CLINICS AND GENERAL HOSPITALS; by Egilda De Amicis, Charles K. Spalding, and Russell F. Cowing. [nd] 8p. (AECU-1749)

Data presented show that of 1100 film badges worn by roentgenologists over a period of 1 yr, 7 films or 0.63% showed exposures above the present permissible weekly tolerance (300 mr). Of 2740 film badges worn by technicians over the same period, 3 films or 0.11% revealed overexposure. These figures are in good agreement with a previous 9 months period survey made by the authors where of 2655 films, 11 films or 0.41% showed overexposure.

780

Brookhaven National Lab.

METEOROLOGICAL FACTORS IN ATMOSPHERIC POLUTION PROBLEMS; by Maynard E. Smith. Apr. 26, 1951. 14p. (BNL-1070)

The influence of meteorological parameters in the dispersion of cooling air from the Brookhaven nuclear reactor stack has been under investigation for three years. The empirical results obtained with an oil-fog test effluent are compared with theoretical expectations, and the apparent causes of the discrepancies are analyzed. Two methods of obtaining engineering estimates of ground-level concentrations arising from elevated sources are briefly described, together with an assessment of their probable limitations. (auth)

781

Oak Ridge National Lab.

NOTES ON A SERIES OF LECTURES ON HEALTH PHYSICS PRESENTED TO THE PERSONNEL OF PHILLIPS PETROLEUM COMPANY; APRIL 4-20, 1951; by Charles D. Cagle. Issued Nov. 8, 1951. 45p. (CF-51-4-173)

These notes on a series of lectures on health physics include a brief history of work in the field of radiation, the biological effects of radiation and the interaction of radiation and matter, units of measurement of radiation, maximum permissible exposure levels, control of radiation hazards, neutron shielding, fission products, instruments for radiation detection, instrument calibration, contamination control and decontamination, and waste-disposal problems.

782

OPTIMUM CONDITIONS FOR ROENTGENOGRAPHIC STUDY OF THE SIZE OF PARTICLES SEPARATED FROM SOILS AND CLAYS. N. I. Gorbunov and I. G. Tsyurupa. Doklady Akad. Nauk S.S.S.R. 77, No. 4, 717-20(1951). Apr. 1. (In Russian)

Results obtained in size classification and determination by x-ray scattering of particles from <1 to 250 μ in diameter are tabulated for various soils.

783

STRAY X-RAYS FROM ELECTRON BEAM INSTRUMENTS AND SOME BIOLOGICAL IMPLICATIONS. S. D. Larks. Am. Ind. Hyg. Assoc. Quart. 12, 175-9(1951) Dec.

Electron-beam instruments of many types, operating with moderate to high accelerating potentials, are considered as potential or actual sources of stray x radiation. Oscillographs and electron microscopes are discussed in detail as possible sources of radiation above tolerance level. Biological effects of x radiation are reviewed.

RADIATION SICKNESS

784

Institute of Radiobiology and Biophysics, Univ. of Chicago

THE TREATMENT OF POST-IRRADIATION INFECTION WITH ANTIBIOTICS; AN EXPERIMENTAL STUDY ON MICE; PART I AND PART II; by C. Phillip Miller, Carolyn W. Hammond, Marianne Tompkins, Gertrude Shorter, George Sacher, Sylvanus A. Tyler, and Joan

Gurian. Institute of Radiobiology and Biophysics, Univ. of Chicago and Argonne National Lab. [nd] 65p. (AECU-1730)

Young adult mice were subjected to total-body x radiation in a single exposure, varying from 450 to 600 r. After irradiation the mice were treated daily with antibiotics; one only or several in combination were used. Streptomycin, given by subcutaneous injection, decreased mortality from 73% in control animals to 14%. Penicillin given in addition to streptomycin did not increase its effectiveness. Chloramphenicol, aureomycin, and terramycin (mixed in food) caused significant reductions in mortality; their supplementation by daily injections of streptomycin during the second and third weeks post-irradiation increased the protection. Neomycin was ineffective, polymyxin too toxic. Infections or epidemics by drug-resistant strains could not be controlled by the antibiotics used and the importance of infection as a lethal factor in mice exposed to moderate doses of x radiation is stressed.

Data on the effects of various patterns of antibiotic therapy on the survival of mice following a fixed dose of x rays were subjected to biometric analysis. Streptomycin dosages ranging from about 3000 to 6000 units per day were protective to the same degree. Penicillin plus streptomycin alone. Aureomycin, chloramphenicol, and terramycin, all supplemented with streptomycin, conferred about equal degrees of protection. The measure of protection employed was the difference of probits of mortality for control-therapy cage pairs. This measure was validated by an analysis of the relation between per cent mortality in cages and mean survival time of decedents. The probit difference was shown to have a small positive regression on level of killing in cages.

RADIOGRAPHY

785

ATTACHMENTS FOR PRODUCING TOMOGRAPHIC X-RAY PHOTOGRAPHS. E. Both. Fortschr. Gebiete Röntgenstrahlen 75, 646-9(1951) Nov. (In German)

A tomographic apparatus is described which can be used as an x-ray attachment for use in radiography and radioscopy. Movement of film and x-ray tube are so coordinated as to eliminate the shadow details of all but a selected layer of the object.

RADIOTHERAPY

786

COBALT FOR CANCER. Precambrian 24, 8-9(1951) Dec.

The radiocobalt unit for cancer therapy installed in the University Hospital in Saskatoon, Canada, is illustrated and briefly described. It was the first such unit to be installed anywhere in the world.

TOXICOLOGY STUDIES

787

COLLECTION OF REPRINTS ON RADIUM POISONING; by Harrison S. Martland, reprinted by Technical Information Service, AEC. 1925-1939. 193p. (NP-3544)

Several papers by this author are reprinted here, including data gathered on the effects of Ra poisoning on dial painters, occurrences of osteogenic sarcoma and anemia due to Ra toxicology, and interrelationship of certain blood diseases.

788

THE CONTROL OF BERYLLIUM OXIDE IN THE CERAMIC INDUSTRY. A. J. Breslin. Am. Ceram. Soc. Bull. 30, 395-8(1951) Nov.

A review of industrial hygiene methods employed at plants producing beryllium is presented. Acute pneumonitis has been eliminated at plants operated in compliance with AEC recommendations, and during the past 3 years no case of chronic disease attributed to beryllium toxicity has been found.

TRACER APPLICATIONS

789

Johns Hopkins Univ.

ADSORPTION AND ASSIMILATION OF P^{32} BY BACTERIAL SLIMES; FOR NOVEMBER 15, 1948, TO NOVEMBER 15, 1949; FINAL REPORT; by George W. Reid. Mar. 20, 1950. 16p. (JHUX-4)

790

Virginia Univ. Medical School

EFFECT OF INSULIN IN VITRO ON PHOSPHATE UPTAKE BY ERYTHROCYTES FROM DIABETIC HUMANS; by D. R. H. Gourley. 14p. [nd] (AECU-1773)

In four out of eight samples of blood obtained from six diabetic patients the addition of insulin accelerated the rate of P^{32} uptake by erythrocytes. The effect of insulin in these four instances is consistent with the view that one action of the hormone is to promote the uptake of inorganic phosphate by blood cells.

791

Harvard Univ. Medical School

THE EFFECT OF CHOLINESTERASE AND CHOLINE ACETYLASE INHIBITORS ON THE POTASSIUM CONCENTRATION GRADIENT AND POTASSIUM EXCHANGE OF HUMAN ERYTHROCYTES; by Isaac M. Taylor, John Weller, and A. Baird Hastings. [nd] 19p. (AECU-1766)

Studies with K^{42} on the effect of cholinesterase and choline acetylase inhibitors on distribution and exchange across the human red-cell membrane, show a marked difference in the net K leakage of erythrocytes induced by the two inhibitors. Cholinesterase inhibitors (physostigmine and diisopropyl-fluorophosphate) cause a loss of K from the cells due to a decrease in the rate at which K enters the cells from the plasma. No direct relationship was found between inhibition of cholinesterase activity and K leakage. Choline acetylase inhibitors (methylene blue and 2-methyl-1,4-naphthoquinone) cause a loss of K from the cells due to an increase in the rate in which K leaves the cells.

792

Lankenau Hospital Research Inst.

OXIDATION OF ENDOGENOUS FATTY ACIDS OF RAT TISSUES, IN VITRO; by Murray E. Volk, Ruth H. Millington, and Sidney Weinhouse; Lankenau Hospital Research Inst.; Institute for Cancer Research, Philadelphia; and Temple Univ. [nd] 24p. (AECU-1765)

Radioactive, carboxyl-labeled palmitate was administered ingastrically to 24-hr fasted rats, and, at various intervals thereafter, tissues were removed, sliced or minced, and allowed to respire in vitro. All tissues were found to oxidize the labeled acid, including brain and skeletal muscle. At short intervals after feeding the labeled acid, the respiratory CO_2 had a higher specific activity than the total fatty acids of the same tissue, indicating the presence of a metabolically active fatty acid fraction which is not in rapid equilibrium with the tissue lipids. This metabolically active fraction seemed not to be phospholipide, and phospholipides seem not to be obligatory intermediates in the transport of fatty acids into cells. (auth)

793

Harvard Univ. Medical School

RATE OF POTASSIUM EXCHANGE OF THE RAT ERYTHRO-

CYTE; by John M. Weller and Isaac M. Taylor. [nd] 5p. (AECU-1753)

Diluted whole blood of white rats was incubated at 35 to 36°C and equilibrated with 5% CO_2 and 95% O_2. $K^{42}Cl$ was used as tracer. Percentage of cells, K content, and radioactivity of diluted whole blood and of the diluted plasma were determined periodically for 10 to 12 hr. The rate of the entrance of K into the rat erythrocytes from the suspending medium was determined by plotting the log radioactivity of the diluted plasma compartment against time. The number of millimoles of K exchanging per hour was calculated by multiplying the percentage of the radioactivity of the diluted plasma compartment entering the cells per hour by the number of millimoles of K present in the plasma compartment, and the mean value of exchange was found to be 5.24. The mean value for the percentage of the erythrocyte K which was exchanging every hour per liter of cells was 4.99. Glucose was utilized at the rate of 2.47 millimoles per liter of rat red cells per hour. The number of millimoles of K exchanging per liter of red cells per hour for the rat is about 3½ times that found for the human. On a cell-surface-area basis, the rat cell exchanges nearly 3 times as much K per unit time as does the human erythrocyte.

794

Lankenau Hospital Research Inst.

THE BIOSYNTHESIS OF ARGININE BY TORULOPSIS UTILIS; by Murray Strassman and Sidney Weinhouse; Lankenau Hospital Research Inst.; Institute for Cancer Research, Philadelphia; and Temple Univ. [nd] 18p. (AECU-1750)

To obtain information concerning the biosynthesis of arginine in yeast, this amino acid was isolated from Torulopsis utilis cells grown on glucose in the presence of various small molecules labeled with C^{14}. The ornithine moiety of arginine synthesized in the presence of methyl- and carboxyl-labeled acetate, methylene- and carboxyl-labeled glycine, carboxyl-labeled lactate, and formate had the distribution of labeled carbon which would be expected in α-ketoglutarate formed during the intermediary metabolism of these labeled substances via the citric acid cycle. It was therefore concluded, in confirmation of earlier studies, that the intact α-ketoglutarate carbon skeleton is the direct source of the 5-carbon chain of arginine, presumably via glutamate, ornithine and citrulline. (auth)

795

RADIOAUTOGRAPHIC LOCALIZATION OF RADIOISOTOPES IN PLANTS. V. M. Klechkovskiĭ and T. P. Evdokimova. Doklady Akad. Nauk S.S.S.R. 79, 629-33(1951) Aug. 1. (In Russian)

P^{32} and S^{35} are compared as to use in radioautography, and radioautographs of P^{32} localization in corn stalks and in an apple are shown.

796

DISTRIBUTION OF INTRAVENOUSLY INJECTED RADIOACTIVE PHOSPHORUS (P^{32}) AMONG SWINE TISSUE. Arthur H. Smith, Max Kleiber, Arthur L. Black, Melvin Edick, Robert R. Robinson, and Hubert Heitman, Jr. J. Animal Sci. 10, 892-901(1951) Nov.

The distribution of intravenously injected radioactive phosphate in the tissues of swine of different ages and at different times after injection is reported.

797

A METHOD FOR STUDYING THE EFFECT OF P^{32} ON LIVING ADULT HUMAN EPIDERMAL CELLS IN A PERFUSION CHAMBER. F. N. Hu, S. G. Holmes, C. M. Pomerat, C. S. Livingood, and K. P. McConnell. Texas Repts. Biol. Med. 9, 738-48(1951) Winter.

Experiments are reported on the effect of P^{32} on living adult human epidermal cells when introduced in a nutrient fluid within a perfusion chamber designed to permit still- and motion-picture photographic recordings of cellular structure. This preliminary study is designed to illustrate the feasibility of the method with respect to observations upon adult human tissues.

798

INCORPORATION OF SHORT CHAIN FATTY ACIDS INTO PHOSPHOLIPIDES BY THE RAT. B. P. Stevens and I. L. Chaikoff. J. Biol. Chem. 193, 465-72(1951) Dec.

The capacity of the rat to incorporate short-chain fatty acids into phospholipid molecules has been demonstrated by recovering a 12-C fatty acid containing C^{14} from phospholipid fatty acids of the bodies of rats that had been fed lauric acid-1-C^{14} and by isolating 14-C fatty acids containing C^{14} from tissue phospholipids after myristic acid-1-C^{14} had been administered. Rapid conversion of fed lauric and myristic acids to 16- and 18-C fatty acids has been demonstrated by isolating the latter from the phospholipid and nonphospholipid fatty acids of rats fed lauric acid-1-C^{14} or myristic acid-1-C^{14}. Well over 90% of the fatty acids C^{14} found in the tissues was present in the 16- and 18-C acids. After myristic acid has been eaten for prolonged periods it is stored in the phospholipids and nonphospholipids of the rat liver.

799

INCORPORATION OF LABELED PHOSPHATE INTO THE LIPIDES OF LIVER SLICES. Camillo Artom and Marjorie A. Swanson. J. Biol. Chem. 193, 437-9(1951) Dec.

Slices from the livers of rats previously maintained on a 5% casein diet incorporated inorganic P^{32} into the lipides at a lower rate than liver slices from rats on a stock diet or on a 25% casein diet. Supplementation in vivo of the low protein diet with choline prevented or reversed the fatty infiltration but did not raise the ability of the isolated liver to synthesize phospholipides from inorganic phosphate. The addition of choline in vitro inhibited the formation of phospholipides in the liver slices from rats on the high protein diets. When the rats had been previously maintained on low protein diets, choline added in vitro to the liver slices stimulated the process to a certain extent. (auth)

CHEMISTRY

800

Illinois Univ.

DIFFUSION THROUGH AN INTERFACE; by E. J. Scott, L. H. Tung, and H. G. Drickamer. [nd] 13p. (AECU-1744)

The diffusion equation has been solved for the case of two cells of finite length with an interface between the cells. The effect of an interfacial resistance to mass transfer has been considered. It is shown that the situation where there is equilibrium (no resistance) at the interface is a special case of our solution. Several important cases are considered numerically. (auth)

801

Illinois Univ.

DIFFUSION IN CO_2 UP TO 150 ATMOSPHERES PRESSURE; by W. L. Robb and H. G. Drickamer. [nd] 19p. (AECU-1757)

Diffusion coefficients have been obtained for the system CO_2-$C^{14}O_2$ up to 150 atmospheres pressure and from 0° to 45°C. The coefficients are consistent with theory up to a density of 0.067 g/cc. In the range from 0.067 to 0.70 g/cc the coefficients are higher than predicted by theory. This may be attributed to a reduced collision diameter due to

orientation of the nonspherical molecules. At higher densities the experimental coefficients are lower than the theoretical ones. This is expected as the theory breaks down at these high densities. At densities above 0.65 g/cc no measurable temperature coefficient was obtained. This may be explained by increased orientation at lower temperatures and in the liquid state. (auth)

802

Virginia Univ. Medical School

FAILURE OF P^{32} TO EXCHANGE WITH ORGANIC PHOSPHORUS COMPOUNDS; by D. R. H. Gourley. [nd] 7p. (AECU-1763)

Since, in an experiment on human erythrocytes, a marked uptake of P^{32} was observed in glucose-1-phosphate, adenylic acid, 2,3-diphosphoglyceric acid and adenosinetriphosphate, an attempt was made to determine how much of the P^{32} uptake could be attributed to simple exchange reactions. P^{32} in the form of $Na_3PO_4.12H_2O$ was added to each of the foregoing substances, and the mixtures were given treatment similar to that used in fractionating the acid-soluble phosphorus compounds of different tissues. No exchange was observed between the inorganic phosphate and the organic phosphate groups. It was concluded that incorporation of P^{32} into these compounds in experiments with tissue under these conditions must be considered to be a result of metabolic reactions.

803

Virginia Univ. Medical School

THE KINETICS OF THE INHIBITION BY THYROXINE OF THE CUPRIC CHLORIDE CATALYZED OXIDATION OF ASCORBIC ACID; by C. L. Gemmill and R. L. Plunkett. [nd] 13p. dwgs. (AECU-1764)

A study has been made of the thyroxine inhibition of the cupric chloride catalyzed oxidation of ascorbic acid by varying each of the three reactants: (1) thyroxine, (2) cupric chloride, and (3) ascorbic acid. The results demonstrate a definite reaction between cupric chloride and thyroxine in the approximate ratio of one mole of cupric chloride to three moles of thyroxine. This reaction is considered to be due to a specific complex formation between copper and thyroxine. (auth)

804

Illinois Univ.

DIFFUSION THROUGH AN INTERFACE; TERNARY SYSTEM; by L. H. Tung and H. G. Drickamer. [nd] 13p. (AECU-1770)

Diffusion measurements have been made at 22 and 40° C in the system phenol-H_2SO_4-water, using S^{35}-tagged H_2SO_4 as a radioactive tracer. Measurements made through the interface indicate that a significant resistance resides in the interface at both temperatures, and that the solution chemistry of the system must be quite complex. The relation of the results to practical mass transfer problems is briefly discussed. (auth)

805

Los Alamos Scientific Lab.

THE LOGARITHMIC GROWTH LAW FOR THE OXIDATION OF TITANIUM; by J. T. Waber, G. E. Sturdy, and E. M. Wise. [nd] 14p. (AECU-1790; LADC-1050)

Oxidation of Ti below 350°C was found to follow the logarithmic growth law, as reported by Alexander and Pidgeon (Can. J. Research, 28 (B), 60-72(1950)). The break in the Arrhenius plot, reported by Gulbransen and Andrew (J. Inst. Metals 75, 741(1949)) is due to the change from the logarithmic to the parabolic rate law at temperatures increasing above 350° C.

806

Pennsylvania State Coll.

POLAROGRAPHIC BEHAVIOR OF ORGANIC COMPOUNDS; XII. IODINATED BENZOIC ACIDS, PHTHALIC ANHYDRIDES, AND PHTHALATES; by Philip J. Elving and Clifford L. Hilton. Aug. 10, 1951. 18p. (NYO-845)

Benzoic acid and phthalic anhydride give no polarographic waves in the pH range of 5.4 to 11.5. In ammonium chloride–ammonium hydroxide buffer step by step removal of halogen atoms was observed for polyiodophthalic anhydrides. Tetraiodophthalic anhydride yields four waves, triiodophthalic anhydride three waves, each of the four diiodophthalic anhydrides two waves, and 4-iodophthalic anhydride one wave. The reduction in each case corresponds with the fission of one carbon-halogen bond and the replacement of the halogen by hydrogen. In all other buffers, 3,6-diiodophthalic anhydride gives but one wave and triiodophthalic anhydride two waves; one wave in each case is apparently due to a loss of two halogen atoms. All other diiodo derivatives show two waves regardless of buffer or pH. The correlation of reduction potential and position in the molecule has been indicated for the iodo derivatives of benzoic and phthalic acids. (auth)

807

Pennsylvania State Coll.

POLAROGRAPHIC BEHAVIOR OF ORGANIC COMPOUNDS; XIII. THE CHLOROACETIC ACIDS AND THEIR ETHYL ESTERS; by Philip J. Elving and Ching-Siang Tang. Aug. 10, 1951. 33p. (NYO-846; Report No. 8)

The chloroacetic acids were investigated at 0 and 25°C over the pH range of 0.7 to 11. At 25° the ethyl chloroacetates hydrolyzed rapidly in alkaline solution, and therefore only the acid region was investigated at this temperature. However, the esters could be studied in the alkaline region at 0°C. The reduction of the chlorinated acids and esters involves the successive removal of chlorine atoms, e.g., trichloroacetate group to dichloroacetate and then to monochloroacetate and finally to acetate. The half-wave potentials for the fission of carbon-chlorine bonds in the three ethyl esters of the chloroacetic acids are independent of pH in both buffered and unbuffered solutions. The half-wave potentials for similar bond fissions in the chloroacetic acids are independent of pH in the regions where the compounds exist essentially either as the undissociated acid or as the anion; in the intermediate pH region, where both forms coexist, the half-wave potential becomes more negative as pH increases. In the pH region of 4.4 to 7.11 (McIlvaine buffer) and 8.8 (disodium hydrogen phosphate buffer) the anion of trichloroacetic acid shows two reduction waves, one of which is due to interaction of the anion with buffer component forming a more easily reduced species, while the other is due to noninteracted anion. The carbon-chlorine bonds in the esters are more easily severed than the corresponding bonds in the undissociated acids; the bonds in the corresponding anions are the most difficultly reduced. Possible explanations for such behavior are given.

808

Pennsylvania State Coll.

POLAROGRAPHIC BEHAVIOR OF ORGANIC COMPOUNDS; PROGRESS REPORT FOR THE PERIOD DECEMBER 1, 1950, TO OCTOBER 30, 1951; by Philip J. Elving, W. Conard Fernelius, and George L. Haller. [nd] 11p. (NYO-852)

The polarographic behavior of homologous, isomeric, and related series of organic compounds was investigated to (1) correlate polarographic behavior and constants with structure, (2) elucidate the reaction mechanisms involved, (3) evaluate the fundamental factors influencing polarographic behavior, (4) establish precise polarographic data, and (5) develop analytical procedures. During the period covered, the work of the project has been increased in scope

from the simple aliphatic halogenated acids to include a study of carbon-halogen bond fission in various types of both aliphatic and aromatic acids, esters, aldehydes, ketones, and alcohols. In addition, work was done on various types of aliphatic and aromatic ketones including thenoyl trifluoroacetone. The study of the specific effects of the environment was broadened by investigating a reversible ionizable system and an irreversible nonionizable system. (auth)

809

Radiation Lab., Univ. of Calif.

HEATS, FREE ENERGIES, AND ENTROPIES IN LIQUID AMMONIA; by William L. Jolly. June 15, 1951. 17p. (UCRL-1402)

Thermodynamic data for liquid ammonia when used as a solvent are reviewed. Thermodynamic functions for 22 ammoniacal species in liquid ammonia are tabulated and calculations for heats of formation and free energies of formation of liquid ammonia with a number of elements are presented.

810

THE HALIDES OF NIOBIUM (COLUMBIUM) AND TANTALUM. PART III. THE VAPOUR PRESSURES OF NIOBIUM (COLUMBIUM) AND TANTALUM PENTAFLUORIDES. Fred Fairbrother and William C. Frith. J. Chem. Soc., 3051-6(1951)Nov.

Measurements have been made, by a static method using a Bourdon-type sickle gauge and by boiling-point determinations under a number of controlled pressures, of the vapor pressures of niobium and tantalum pentafluorides: m.p.'s: NbF_5, 80.0°C; TaF_5, 95.1°C; b.p.'s (760 mm.): NbF_5, 234.9°C; TaF_5, 229.2°C. The tantalum pentafluoride, like the pentachloride and pentabromide, is more volatile than the corresponding niobium compound. The Trouton constants of all seven pentahalides examined (including TaI_5) are given and suggest some association in the liquid state. A mixture of the fluorides prepared directly by fluorination of commercial ferrocolumbium is an excellent Friedel-Crafts-type catalyst. (auth)

811

ELECTROLYSIS IN PHOSPHATE MELTS. IV. ON THE ELECTROLYSIS OF VANADIUM, NIOBIUM, AND TANTALUM OXIDES IN PHOSPHATE MELTS. Hellmuth Hartmann and Werner Mässing. Z. anorg. u. allgem. Chem. 266, 98-104(1951) Oct. (In German)

The principle of the microcosmic salt-bead test, the high solvent power of alkali phosphates for metal oxides, has been applied to the electrolysis of V_2O_5, Ta_2O_5, and Nb_2O_5. In acid melts ($Na_2O:P_2O_5 < 1$) V_2O_5 is reduced to the III valence state. In weakly alkaline melts ($Na_2O:P_2O_5 > 1$) VP is deposited on the cathode. In alkaline melts containing NaCl, V_2O_5 is precipitated in high purity. VO of NaCl structure is formed in strongly alkaline melts; its lattice constant a = 4.12 A. The VO thus prepared is thermally unstable and disproportionates on heating to 950°C in a high vacuum, giving V_2O_3 and V. Attempts to electrolyze the more basic Ta and Nb oxides resulted in attack by the electrolyte on the Ni cathode, so that TaP, NbP, and Ni were precipitated together.

ANALYTICAL PROCEDURES

812

Iowa State Coll.

DETERMINATION OF ADENINETHIOMETHYLRIBOSIDE AND 5-THIOMETHYLRIBOSE AND THEIR DIFFERENTIATION FROM METHIONINE; by Raymond L. Smith and F. Schlenk. [nd] 13p. (AECU-1774)

Adeninethiomethylriboside and thiomethylribose can be determined by the nitroprusside reaction used in methionine assay and formerly considered as specific for this amino acid. In contrast to methionine, these compounds do not yield stable periodides at pH 7. Separation of adeninethiomethylriboside from methionine and from thiomethylribose is accomplished by precipitation with phosphotungstic acid. Combination of these procedures permits individual assay. (auth)

813

Institute for Atomic Research, Iowa State Coll.

COMPLEXES IN OXIDATION-REDUCTION REACTIONS; THE COPPER(II)-CYANIDE REACTION; by Frederick R. Duke and Welby G. Courtney. [nd] 10p. (AECU-1782; Contribution No. 122)

Many homogeneous oxidation-reduction reactions have been shown to involve coordination complexes as intermediates. In the present work, copper(II) is shown to coordinate four cyanide ions, this complex ion then yielding $Cu(CN)_3^{--}$ and CN radical; high concentrations of ammonia are present in the reaction mixture in order to compete with the cyanide ions for the coordination positions on the copper(II) ion, thereby bringing the rate of the reaction into a measurable range. A possible reason for the necessity of four cyanide ions in the reacting complex is discussed.

814

Dow Chemical Co.

FLUORIMETRIC DETERMINATION OF URANIUM IN PHOSPHORIC ACID; by M. D. Yeaman. Dec. 12, 1951. 39p. (DOW-65)

This procedure involves the addition of aluminum nitrate to the liquid sample and the extraction of uranyl nitrate by pentaether prior to the formation of fluorescent uranyl fluoride. A step-by-step procedure and detailed instructions, with drawings, for construction of the modified fluorimeter used are included.

815

North American Aviation, Inc.

DETERMINATION OF SMALL AMOUNTS OF POTASSIUM, CALCIUM, AND MAGNESIUM IN SODIUM METAL AND SOME SODIUM SALTS; by L. Silverman. Nov. 27, 1951. 18p. (NAA-SR-162)

Metallic sodium is decomposed with methyl alcohol and converted to the chloride with hydrochloric acid; sodium hydroxide and sodium salts are also converted to chloride by appropriate means. Measured saturated aqueous chloride solutions are treated with dry hydrogen chloride gas, which separates nearly all of the sodium chloride. The residual potassium, calcium, and magnesium may then be determined by conventional methods. Calcium and magnesium may also be determined with or without the preliminary sodium chloride separation. Iron oxide and silica appear in the analytical separations. (auth)

816

Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.

ANALYSIS OF MIXTURES OF CARBOXYLIC ACIDS BY SPECTROPHOTOMETRIC DETERMINATION OF RATE OF REACTION WITH DIPHENYLDIAZOMETHANE; by John D. Roberts and Clare M. McGinnis. [nd] 12p. (NYO-772)

Procedures have been developed for the analysis of carboxylic acid mixtures by spectrophotometric determination of reaction rate with diphenyldiazomethane in alcohol or benzene solution. The median deviations in about 25 determinations of different types including mixtures of acetic and benzoic acids, m- and p-methoxybenzoic acids, and acetic and chloroacetic acids were about 2%. (auth)

817

Radiation Lab., Univ. of Calif.

CARBONATE CLEAVAGE IN THE HYDROLYSIS OF DIETHYL α-NAPHTHYLMALONATE; by Arthur Fry and Melvin Calvin. Nov. 26, 1951. 18p. (UCRL-1569)

A kinetic product study of the carbonate cleavage of malonic ester has been made, and it is shown that the formation of carbonate from malonic ester in alkaline solution involves the direct fission of the half acid ester. (auth)

818

Radiation Lab., Univ. of Calif.

RADIOCHEMICAL METHODS FOR THE ISOLATION OF ELEMENT 87 (FRANCIUM); by Earl K. Hyde. Nov. 27, 1951. 18p. (UCRL-1578)

Radiochemical methods are presented for the isolation of element 87, francium. Since the longest-lived isotope of Fr has a half life of 21 min, these are necessarily short. The methods used by Mme. Perey for the isolation of AcK are renewed. Procedures based on her work and on the work of others concerned with the isolation of radioactive Cs fission products are presented for the isolation of Fr isotopes from Th targets bombarded with high-energy protons. An entirely new method for the rapid isolation of a carrier-free Fr fraction based on the coprecipitation of this element with free silicotungstic acid is introduced and applications are discussed. (auth)

819

AMINO-ACIDS AND PEPTIDES. PART V. DETERMINATION OF L-GLUTAMIC ACID BY THE ISOTOPE DILUTION METHOD. C. C. Barker, I. W. Hughes, and G. T. Young. J. Chem. Soc., 3047-51(1951) Nov.

The accuracy of the N^{15} isotope dilution method for the determination of L-glutamic acid has been examined by using synthetic mixtures of amino acids. Individual results are within 0.7% of the theoretical, while the mean is 99.7% of the theoretical value. The procedure has been used to determine the L-glutamic acid formed on hydrolysis of a sample of gliadin. (auth)

820

POLAROGRAPHIC DETERMINATION OF LITHIUM IN SILICATES. A. Voigt. Z. anal. Chem. 133, 44-6(1951). (In German)

The Li content of silicates such as lepidolite and zinnwaldite may be determined polarographically with accuracy comparable to gravimetric determinations. Tetramethylammonium hydroxide is used as solvent to avoid loss of Li in $Al(OH)_3$ or $Fe(OH)_3$.

821

SOME OBSERVATIONS ON THE QUANTITATIVE DETERMINATION OF LITHIUM. Barbara Grüttner. Z. anal. Chem. 133, 36-43(1951). (In German)

Precipitation as $LiZn(UO_2)_3(CH_3COO)_9.6H_2O$ was found to be the best method of determining small quantities (0.6 to 10 mg) of Li. The error at ~2 mg of Li was ~1.5%. Reasons for considering precipitation as the sulfate or aluminate as unsatisfactory are given.

822

THE QUANTITATIVE DETERMINATION OF DEUTERIUM USED IN TRACER INVESTIGATIONS. M. E. Reinders. Chem. Weekblad 47, 785-9(1951) Oct. 20. (In Dutch)

Methods used to determine the D concentration in water or hydrogen, including thermal-conductivity measurement, density determination, spectroscopy, refractometry, and mass spectrography, are described briefly.

823

ANALYTICAL CHEMISTRY OF ZIRCONIUM. PART I. BENZILIC ACID. M. Venkataramaniah and Bh. S. V. Raghava Rao. J. Indian Chem. Soc. 28, 257-60(1951) May.

Pure zirconyl chloride was obtained from zircon by a combination of published procedures. It is shown that benzilic acid precipitates Zr from solutions up to 0.225N in HCl. Separation from most divalent and trivalent elements occurs in a single precipitation with the reagent in 0.20N HCl. In other cases (except tin and titanium) a second precipitation yields a pure Zr compound. The precipitate of Zr benzilate has the approximate composition, $O = Zr<^{OH}_{B}.{}_4H_2O$ and is a basic salt. (auth)

824

ON THE DETERMINATION OF SMALL CONCENTRATIONS OF SCANDIUM BY CHEMICAL METHODS. Werner Fischer, Ottmar Steinhauser, and Emil Hohmann. Z. anal. Chem. 133, No. 1/2, 57-72(1951). (In German)

Determination of Sc in concentrations as low as 10^{-3}% by precipitation of ammonium scandium tartrate followed by ceric oxidation is described. The presence of interfering elements may be avoided by ether extraction from concentrated thiocyanate solution or by coprecipitation of Y. Other microchemical methods for Sc determination are discussed briefly, and the results of analyses of minerals, flue dusts, etc., are listed.

825

QUALITATIVE SEMIMICRO-ANALYSIS WITH REFERENCE TO NOYES AND BRAY'S SYSTEM: ANALYSIS OF THE COMBINED ALKALINE-EARTH AND ALKALI GROUPS. Christina C. Miller and Robert J. Magee. J. Chem. Soc., 3188-90(1951) Nov.

A scheme of analysis is presented for the detection and approximate estimation of 0.1 to 20 mg of Ba, Ca, Sr, Mg, Na, Li, K, Rb, and Cs in mixtures containing a maximum of 20 mg of these cations in 0.4 ml of solutions of their chlorides. In separate portions Ba, Mg, and Cs are detected and estimated by means of potassium chromate, p-nitrobenzeneazoresorcinol, and K tetraiodobismuthate, respectively. From a fourth portion Ca is extracted by means of concentrated nitric acid and converted into Ca sulfate. Three further portions are submitted to different chromatographic separations on paper. In one, Sr is identified as its rhodizonate, in another, the fluorescent Na and Li Zn uranyl acetates are formed, and, in the last, the hexanitrites of K, Rb, and Cs with Pb and Co are produced. (auth)

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

826

Illinois Univ.

THE EFFECT OF PRESSURE ON SCINTILLATION PHOSPHORS; by A. J. Reinsch and H. G. Drickamer. [nd] 7p. (AECU-1758)

The effect of pressure to 10,000 atm on the efficiency of Cd, WO_4, and anthracene phosphors has been measured. A reversible pressure effect was noted with $CdWO_4$. No effect was found for anthracene. The results can be interpreted in terms of a shift in the emission curves together with the variation in response of the 1P21 photomultiplier tube used. (auth)

827

STRUCTURE OF $Cu_{32}Al_{19}$. A. J. Bradley. Nature 168, 661(1951) Oct. 13.

The crystal structure of $Cu_{32}Al_{19}$ is discussed and the cause of its abnormally low symmetry is explained.

DEUTERIUM AND DEUTERIUM COMPOUNDS

828

AN AUTOMATIC HEAVY WATER ELECTROLYSIS APPARATUS. B. S. Rabinovitch and John E. Douglas. Rev. Sci. Instruments 22, 839(1951) Nov. (Laboratory and shop note)

A modification of Waniek's (Rev. Sci. Instruments 22, 262 (1950)) constant-pressure device for electrolyzing heavy water is described to provide a completely automatic generation and take-off system. A diagram of the apparatus is shown.

FLUORINE AND FLUORINE COMPOUNDS

829

THE ACTION OF FLUORINE ON CHLORATE. PRELIMINARY REPORT. Hans Bode and Ernst Klesper. Z. anorg. u. allgem. Chem. 266, 275-80(1951) Nov. (In German)

Various gaseous products, depending on the reaction temperature, result from the reaction of $KClO_3$ with elementary F_2. At 100°C and higher temperatures free Cl_2 appears. From 40 to 60°C the principal product is Cl_2O_6, while from −40 to +20°C the previously unknown ClO_3F (m.p., −110°C; b.p., −46°C) appears. Some vapor-pressure measurements are given for this substance. At still lower reaction temperature another Cl-O-F compound appears, probably ClO_4F.

LABORATORIES AND EQUIPMENT

830

Vitro Corp. of America

PROGRESS REPORT; THIRD QUARTER, 1951: DEVELOPMENT OF LABORATORY WASTE DISPOSAL UNIT; JOB 24-A. Nov. 21, 1951. 15p. (KLX-1364)

The principal effort during the report period was applied to studies of the use of resins dyed with acid-base indicators which would warn of the approach of conditions under which active, volatile, acidic materials would appear in the effluent. To date, a quantity of Dowex-1 impregnated with phenolphthalein inserted after the main resin column appears to be the most desirable resin indicator combination to warn of impending liberation of $C^{14}O_2$ to the atmosphere. An evaluation has been made of specially prepared cationic Nalcite resins for the removal of active material from natural waters by the National Aluminate Corporation mixed-bed ion-exchange unit. The resin mixtures tested included the iron, aluminum, or magnesium form of HCR mixed with HCR-H (cationic) and SAR-OH (anionic). The results showed approximately a three-fold increase in the volume of feed decontaminated as compared to the volume decontaminated by the conventional Nalcite resin mixture, HCR-H (cationic) and SAR-OH (anionic). (auth)

RADIATION CHEMISTRY

831

Radiation Lab., Univ. of Calif.

THE C^{14} ISOTOPE EFFECT IN THE DECARBOXYLATION OF α-NAPHTHYL AND PHENYLMALONIC ACIDS; by Arthur Fry and Melvin Calvin. Nov. 12, 1951. 25p. (UCRL-1564)

The isotope effect on the decarboxylation of certain substituted malonic acids has been measured with C^{14} carboxyl-labeled malonic acids. The effect indicates a ratio of cleavage rates for C^{14}-C^{12} of about 1.1, which is considerably larger than simple mass effect would predict. (auth)

832

Radiation Lab., Univ. of Calif.

THE ISOTOPE EFFECT IN THE DECOMPOSITION OF OXALIC ACID; by Arthur Fry and Melvin Calvin. Nov. 12, 1951. 21p. (UCRL-1565)

The isotope effect in the decarboxylation of oxalic acid has been measured with both C^{13} and C^{14}. The results indicate a somewhat larger isotope effect in both cases than would be expected upon a simple mass-rate theory. The ratios between the two, however, are satisfactory.

833

CHEMICAL ASPECTS OF ATOMIC ENERGY. R. Hurst. Cawthron Lecture Series No. 26. Nelson, N. Z., Cawthron Inst., 1951.

A review is made of the development of radiation chemistry, present applications, and possible future uses.

RADIATION EFFECTS

834

EFFECTS OF X RAYS UPON PLASTICS; PARAMAGNETIC RESONANCE. E. E. Schneider and M. J. Day. Nature 168, 645(1951) Oct. 13.

Paramagnetic resonance spectra of polymethylmethacrylates (commercially prepared plastics), obtained after irradiation, show that the magnetic centers are electrons produced as a result of irradiation and trapped in the plastic lattice. In the dyed specimens the center of resonance lies at a magnetic field corresponding to a g-factor within 0.1% of the free-spin value, whereas in the clear specimen the resonance pattern is shifted down-field by some 20 gauss (g = 2.014), the presence of the dye molecules providing electron traps which are considerably deeper than those in the plastic host holes. The effect of O_2 demonstrated by resonance observations at small x-ray doses with specimens of varying O_2 content and features of the fine structure of the paramagnetic resonance of the observed spectra, reflecting characteristic properties of plastics in general, are explained.

835

EFFECTS OF X-RAYS UPON PLASTICS; ELECTRONIC PROCESSES. M. J. Day and Gabriel Stein. Nature 168, 644-5(1951) Oct. 13.

Three of 32 samples of polymethylmethacrylate (commercially prepared plastics) colored with various materials and one plastic prepared by polymerization of an acrylic monomer colored with Sudan III showed an appreciable change of color when irradiated with x rays. An absorption band at a wavelength longer than the absorption band of the basic dye was developed; the optical density of the new band is dependent on the concentration of the dye in the plastic, since the dye traps some of the electrons liberated from the lattice by radiation, and on O_2 concentration, O_2 competing for the electrons. The colored plastics are explained as being solid systems, in which one has some control over the nature and number of the electron-trapping sites; in these the velocity of thermal back-reaction is sufficiently small to permit accurate observation.

836

MOLECULAR FISSION OF HYDROCARBONS BY ELECTRON IMPACT. M. Magat and R. Viallard. J. chim. phys. 48, 385-98(1951) Sept.-Oct. (In French)

A mass-spectrographic study of the nature and proportions of the fragments formed when numerous hydrocarbons, both saturated and unsaturated, were bombarded with 30- to 175-v electrons is reported. Certain regularities are found for homologous series, particularly for the aliphatic hydrocarbons.

837

ROLE OF THE OXYGEN-CONTAINING RADICALS IN OXIDATIONS AND REDUCTIONS PRODUCED BY IONIZING RADIATIONS. III. ARSENITE-ARSENATE SYSTEM. M. Haïssinsky and M. Lefort. J. chim. phys. 48, 429-37(1951) Sept.-Oct. (In French)

The arsenite ion in aqueous solution is completely oxidized by Rn α rays; the inverse reaction is not observed. X radiation results in a radiochemical equilibrium which is displaced toward the reduced state by increased acidity. In a sufficiently concentrated arsenite solution, α rays cause, at the same time as the oxidation, a partial precipitation of elemental As, considered a direct effect of the radiation. The influence of concentration, temperature, and pH on the oxidation yield has been determined, and the composition of the gaseous product (H_2 + O_2) has been analyzed. The kinetics of the reactions may be explained by considering the α-ray oxidation as essentially the action of H_2O_2 produced by radiolysis of the water, whereas in the

case of x radiation there exists a competition for the OH radical, which is capable both of oxidizing AsO_2^- and reducing AsO_4^{-3}, and probably an unstable As(IV) compound.

838
FADING OF LATENT IMAGES IN CONCENTRATED SILVER BROMIDE EMULSIONS. W. Hälg and L. Jenny. Helv. Phys. Acta 24, 508-16(1951) Nov. 20. (In German)

The fading of the latent image produced in an unstabilized AgBr emulsion by 3-Mev protons and 5.3-Mev α particles has been studied. A long-lived and a short-lived component were found in the image. Comparison with exposures to light showed a relative increase in the long-lived component with the increase in energy absorbed by the grains. The short-lived component was the more susceptible to chemical fading. The different types of latent-image centers found by photochemical investigations are discussed.

RARE EARTHS AND RARE-EARTH COMPOUNDS

839
Ames Lab.
THE HEAT CAPACITIES AND HEAT CONTENTS OF SOLUTIONS OF CERIUM AND NEODYMIUM CHLORIDES AT 25°C; by F. H. Spedding and Carl F. Miller. Dec. 18, 1951. 17p. (ISC-190)

The change in heat capacities of solution and dilution and the change in heat content of solution and dilution of the chlorides of cerium and neodymium have been measured for concentrations up to 0.35 and 0.40 molal, respectively. Both properties of these two electrolytes show agreement with the limiting Debye-Hückel equations within limits of experimental error. (auth)

840
Ames Lab.
THERMOCHEMISTRY OF THE RARE EARTHS; I. CERIUM AND NEODYMIUM; by F. H. Spedding and Carl F. Miller Dec. 18, 1951. 14p. (ISC-191)

The heats of solution of the metals and chlorides in hydrochloric acid, the hydrated chlorides in water, and the heats of precipitation of the oxalates in oxalic acid of cerium and neodymium have been measured. The data have permitted a calculation of the standard heats of formations of these substances as well as an estimate of their free energies of formation. The electrode potentials have been calculated to be 2.335 volts for cerium metal and 2.246 volts for neodymium metal. (auth)

841
THE ELECTROLYTIC DISSOCIATION OF MAGNESIUM SULPHATE AND LANTHANUM FERRICYANIDE IN MIXED SOLVENTS. Helen S. Dunsmore and J. C. James. J. Chem. Soc., 2925-30(1951) Nov.

Conductivity measurements are reported for Mg sulfate in water, dioxan-water mixtures, and glycine solutions, and for La ferricyanide in glycine solutions. Dissociation constants have been derived, and it is shown that a simple electrostatic explanation will account for the variation of dissociation constant with dielectric constant. A comparison is drawn between ion-pair sizes as calculated by Stokes's law and by Bjerrum's method. (auth)

842
SEPARATION OF THE LANTHANONS WITH THE AID OF ETHYLENEDIAMINE NNN'N'-TETRA-ACETIC ACID ("ENTA" ACID). PART III. THE SALT $H_4Na_4Ln_2enta_5 \cdot 24H_2O$ AND ITS USE (a) IN FRACTIONAL CRYSTALLISATION, AND (b) IN DOUBLE-SULPHATE PRECIPITATION. J. K. Marsh. J. Chem. Soc., 3057-60(1951) Nov.

The easily prepared salt $H_4Na_4Ln_2enta_5 \cdot 24H_2O$ gives a rapid separation of the lanthanons by fractional crystallization. An equilibrium, such as $4Na[Ln\ enta], H_4enta \rightleftharpoons 3HLn\ enta + Na[Ln\ enta] + Na_3H\ enta$, with solid solution occurring, is believed to be the reason, HLn enta collecting in head crystals and Na[Ln enta] at the tail. Stability of $H_4Na_4Ln_4enta_5 \cdot 24H_2O$ falls with decreasing basicity in the lanthanon series. The crystallization is most effective for middle earths, but gives a rapid, rough concentration of the ytterbium earths. The potassium salt is isomorphous, but its use is not advantageous. Small amounts of Nd have been eliminated from $H_4Na_4Gd_4enta_5$ solution much more rapidly by double-sulfate precipitation than from $GdCl_3$ solution. (auth)

SEPARATION PROCEDURES

843
Oak Ridge National Lab.
THE SEPARATION AND ANALYSIS OF SUGARS BY ION EXCHANGE (abstract); by Joseph X. Khym. [nd] 1p. (AECU-1805)

Many polyhydroxy compounds react with borate ion with great ease and rapidity to form borate complexes which are negatively charged ions. This reaction is the basis for the development of an ion-exchange method for the quantitative separation and analysis of the components in various sugar mixtures. The sugars are adsorbed on strong-base anion exchangers from dilute borate solutions. Elutions are carried out by successively increasing the concentration of borate ion, and effluent fractions are analyzed colorimetrically for sugar content. Procedures have been developed for the separation and analysis of hexoses, pentoses, disaccharides, hexose-pentose mixtures, monosaccharide-disaccharide mixtures, sugar alcohols, and glycosides. Removal of borate ion is accomplished by converting all borate ion to boric acid and, in the presence of methyl alcohol, distilling off volatile methyl borate. (Entire report)

844
THE CATION EXCHANGE SEPARATION OF ZIRCONIUM AND HAFNIUM. B. A. J. Lister. J. Chem. Soc., 3123-8 (1951) Nov.

The possibility of separating Zr from Hf by elution from a cation-exchange column has been investigated with H_2SO_4, HCl, HNO_3, $HClO_4$, and oxalic acid. A method has been developed, depending on H_2SO_4 elution, whereby gram quantities of the two elements in their naturally occurring proportions (1.5 to 2% Hf) can be separated by one column passage. The method is believed to be the simplest and most satisfactory at present available for the separation of Zr and Hf on a laboratory scale. Detailed column-run data and photographs of equipment may be found in report AERE-C/R-703 (NSA 5-5139).

845
PREPARATION OF In^{115m} IN A SMALL QUANTITY OF CARRIER. H. Laurent. J. chim. phys. 48, 412-14(1951) Sept.-Oct. (In French)

About 15 g of Cd acetate was irradiated in the Châtillon pile for a week and then dissolved in 200 ml of 1M $(NH_4)_2SO_4$ in the cold. $InCl_3$ was added (2 mg of In/100 ml of solution) as carrier. Concentrated NH_4OH then was added from a buret to pH 7 to 8, using a mixed bromthymol blue–phenol red indicator, in order to complex the Cd. The solution was heated to 80°C to flocculate In* $(OH)_3$ and then centrifuged. The precipitate was washed three times with 1% NH_4NO_3 (brought to pH 7 by dilute NH_4OH), then dissolved in 3 ml of hot concentrated HNO_3, diluted to 20 ml, reprecipitated by NH_4OH under the same conditions, centrifuged, washed twice with NH_4OH, and redissolved in a minimum of warm dilute HNO_3. Less than 0.1% long-period activity was found as contaminant.

846
CONTRIBUTIONS TO THE CHEMISTRY OF THE ELEMENTS NIOBIUM AND TANTALUM. VI. SEPARATION OF NIOBIUM AND TANTALUM BY REDUCTION OF NIOBIUM PENTACHLORIDE. Harald Schäfer and Christel Pietruck. Z. anorg. u. allgem. Chem. 266, 151-60(1951) Oct. (In German)

$NbCl_5$ is appreciably more readily reduced than $TaCl_5$. Various experiments with Al and H_2 as reducing agents are described. Nb and Ta preparations may be obtained in greater than 99% purity.

847
CONTRIBUTIONS TO THE CHEMISTRY OF THE ELEMENTS NIOBIUM AND TANTALUM. V. THE PRODUCTION OF TITANIUM- AND TIN-FREE NIOBIUM AND TANTALUM PREPARATIONS. Harald Schäfer, Lisel Bayer, and Christel Pietruck. Z. anorg. u. allgem. Chem. 266, 140-50(1951) Oct. (In German)

Niobium oxide ore containing Ti, Sn, and Ta may be chlorinated with CCl_4 or thionyl chloride, resulting in $TiCl_4$, $SnCl_4$, $TaCl_5$, and $NbCl_5$. The tetrachlorides may be removed by voltatilization or solution in CCl_4. Even mixtures of, for example, 50% Nb_2O_5 and 50% TiO_2, may be readily separated.

848
SEPARATIONS BY PARTITION CHROMATOGRAPHY ON PAPER. (I) STRONTIUM FROM BARIUM, CALCIUM, AND MAGNESIUM. (II) POTASSIUM, RUBIDIUM, AND CESIUM. (III) SODIUM AND LITHIUM. Christina C. Miller and Robert J. Magee. J. Chem. Soc., 3183-7(1951) Nov.

A mixture of concentrated HCl and n-butanol (95 : 5 by vol), saturated with n-butyl chloride, has been used to separate SrCl from Ba, Ca, and Mg chlorides. Sodium rhodizonate has served for the detection and estimation of 2.5 to 500 μg of strontium. Five hundred μg of Ba, Ca, Mg, or any alkali metal did not interfere with the detection of 2.5 μg. K, Rb, and Cs chlorides (total weight of cations $\leq$1 mg) have been separated by means of a mixture of concentrated HCl, methanol, n-butanol, and isobutyl methyl ketone (55 : 35 : 5 : 5). For the detection and estimation of 5 to 1000 μg of the three cations, the Pb Co alkali hexanitrites have been formed. One mg of Na, Li, Ca, Sr, Ba, or Mg did not influence the detection of the minimum amounts. For the separation of Na and Li chlorides a mixture of methanol and n-butanol (4 : 1) has been used. In solutions containing a maximum of 500 μg of any combination of the two cations, 2.5 to 500 μg amounts of both have been detected and estimated in ultraviolet light as the fluorescent alkali zinc uranyl acetates; 500 μg of K, Rb, Cs, Ca, Ba, Sr, or Mg did not influence the results. (auth)

SPECTROSCOPY

849
Atomic Energy Research Establishment, Harwell, Berks (England)
THE APPLICATION OF THE HOLLOW CATHODE SOURCE TO SPECTROCHEMICAL ANALYSIS; PART II. THE MICRODETERMINATION OF ORGANICALLY BOUND FLUORINE; by A. H. C. P. Gillieson and R. A. Newcombe. Sept. 11, 1951. 7p. (AERE-C/R-764)

By the use of the hollow cathode source described by F. T. Birks in Part I (NSA 5-3096), organically bound fluorine has been determined directly, without previous chemical preparation, on micro quantities of organic fluoro-compounds. In the determination of 3 micrograms of fluorine, a probable error of $\pm$17 per cent was achieved. (auth)

850
Radiation Lab., Univ. of Calif.
ULTRAVIOLET ABSORPTION SPECTRA OF OXAZOLONES AND RELATED COMPOUNDS; by Edward L. Bennett and Earl Hoerger. Nov. 19, 1951. 23p. (UCRL-1568)

The ultraviolet absorption spectra of substituted oxazolones and esters and acids derived therefrom are presented. The effect of the solvent on the absorption spectra and on the stability of the oxazolones has been studied. Trans-acylation has now been noted in the preparation of several oxazolones.

SYNTHESES

851
Louisville Univ.
DIMETHYL p-ETHYLBENZENEPHOSPHONATE; by Richard H. Wiley and Charles Harry Jarboe. [nd] 2p. (AECU-1779)

The report consists of a note taken from an honors thesis by C. H. Jarboe and is reproduced here in its entirety.

A search of the literature has failed to disclose any reference to the preparation or characterization of esters of p-ethylbenzenephosphonic acid. We have prepared and characterized the dimethyl ester. This note presents the data observed. A study of the yields obtained in the preparation of p-ethylbenzenephosphine dichloride and some useful modifications in the experimental procedures for conversion of this halide to its dibromide and of this dibromide to the ester are described. Molar refraction was calculated using the constants given by Kabachnik (Izvest. Akad. Nauk S.S.S.R. Otdel. Khim. Nauk 219(1948)).

Experimental

p-Ethylbenzenedichlorophosphine (Jackson, Davies, and Jones, J. Chem. Soc., 2298(1930); Jones et al., J. Chem. Soc., 1446(1947); Michaelis, Ann. 293, 193(1896); 294, 1 (1896)) was prepared by the reaction of p-ethylbenzene with phosphorus trichloride using aluminum chloride as catalyst. Excess phosphorus trichloride was removed by vacuum distillation prior to addition of phosphorus oxychloride to decompose the product–aluminum chloride complex. The phosphorus oxychloride–aluminum chloride complex was precipitated by addition of petroleum ether and separated by filtration (Dye, J. Am. Chem. Soc. 70, 2595(1948)). The crude product obtained on evaporation of the solvent was used in the following reaction without purification. A study of yields from varying proportions of aluminum chloride, ethylbenzene, and phosphorus trichloride gave a maximum yield of 70% of crude product with a molar ratio of 0.5/1/3, respectively, for preparations starting with 0.5 mole of ethylbenzene. p-Ethylbenzenedichlorophosphine dibromide was prepared by addition of bromine to a carbon tetrachloride solution of the crude dichloride with cooling to dissipate the heat of reaction. The orange precipitate was not isolated but used directly in the esterification. Dimethyl p-ethylbenzenephosphonate was prepared by addition of absolute methanol to the carbon tetrachloride suspension of the tetrahalide. Excess bromine was removed by washing with 10% sodium sulfite solution. The ester, which separates from the solution, was collected and fractionated under vacuum. The yield of ester boiling at 131 to 137°C at 2 mm was 70 g from 53 g of ethylbenzene or 66% of the theoretical amount. The yield based on the amount of dichloride used is 94% of the theoretical. The ester was refractionated to give a fraction boiling 133 to 135°C at 2 mm for analysis. N_D^{25} 1.5003; sp. gr. 1.141; d_0^{25} 1.141.

Anal. Calcd. for $C_{10}H_{15}O_3P$: P, 14.48%; saponification equivalent 107; molar refraction, 55.66. Found: P, 14.79%; saponification equivalent, 106.8; molar refraction, 55.26.

852
Radiation Lab., Univ. of Calif.
CHOLESTERYL LAURATE; by David Kritchevsky and Margaret E. Anderson. Dec. 7, 1951. 5p. (UCRL-1600)
Cholesteryl laurate, m.p. 78 to 78.5°, has been prepared from cholesterol and lauroyl chloride. This product represents a hitherto unreported isomorphic modification of the ester. (auth)

853
SYNTHESIS OF FOLIC ACID-9-C^{14}. F. Weygand and G. Schaefer. Naturwissenschaften 38, No. 18, 432-3(1951) Sept. (Note; in German)
The synthesis of folic acid (pteroyl-l-glutamic acid) from p-aminobenzoyl-l-glutamic acid, 2,4,5-triamino-6-hydoxypyrimidine, and acrolein dibromide by Waller et al. (J. Am. Chem. Soc. 70, 19(1948)) did not show whether the methylene group between the pteridine and the p-aminobenzoyl parts arose from the aldehyde group or from the CH_2Br group. To clarify this question the acrolein was labeled with C^{14} by condensation of formaldehyde-C^{14} (from methanol-C^{14} by catalytic dehydration in 84.5% yield) with acetaldehyde in 39.3% yield. Synthesis and subsequent oxidation of folic acid from the labeled acrolein proved that the methylene group arose from the acrolein dibromide. The yield of folic acid was 3.6% based on the methanol or 11.4% based on acrolein.

TRACER APPLICATIONS

854
Radiation Lab., Univ. of Calif.
AN INVESTIGATION OF THE MECHANISM OF THE DECOMPOSITION OF ACETYL PEROXIDE IN ACETIC ACID-2-C^{14}; by Arthur Fry, B. M. Tolbert, and Melvin Calvin. Dec. 4, 1951. 35p. (UCRL-1570)
Decomposition of diacetyl peroxide in acetic acid-2-C^{14} confirmed in general the mechanism of the reaction as proposed by Kharasch and Gladstone (J. Am. Chem. Soc. 65, 15(1943)); the molar ratios of the products obtained being 37 initial CH_3COOH, 1.54 CO_2, 1.13 CH_4, and 0.40 succinic acid. The presence and distribution of activity in the methyl acetate is best explained by the reaction CH_3COO+diacetyl peroxide → methyl acetate+CO_2+CH_3COO (or CH_3 + CO_2). No appreciable exchange of acetic acid and diacetyl peroxide was found. Essentially no exchange of methyl acetate and acetic acid was observed when these reagents were heated at 100° for 5 hr.

URANIUM AND URANIUM COMPOUNDS

855
Carbide and Carbon Chemicals Co., K-25
POLAROGRAPHIC STUDY OF THE REACTION BETWEEN URANIUM(VI) AND URANIUM(IV) IN CARBONATE MEDIA; by E. D. Marshall. Issued June 22, 1951. Decl. Dec. 21, 1951. 15p. (AECD-3289; K-773)
Polarographic and coulometric data are presented to show the existence of a reaction between U(IV) and U(VI) in 1M sodium of potassium carbonate solutions to yield U(V). The anodic polarographic wave attributed to the oxidation of U(V) has a half-wave potential of −0.72 v relative to the saturated calomel half-cell. U(V) is stable in carbonate solutions of pH 11, bút was not found in solutions of pH less than 10. (auth)

856
ON URANIUM OXIDES OF VARIABLE COMPOSITION. André Boullé, Robert Jary, and Marthe Dominé-Bergès. Compt. rend. 233, 1281-4(1951) Nov. 19. (In French)
The existence of tetragonal U_3O_7 in the homogeneous phase between UO_2 and U_3O_8 is shown by oxidation-reduction and x-ray-diffraction experiments. No intermediates, such as U_2O_5, were found between U_3O_7 and U_3O_8. The composition U_3O_7 is difficult to reconcile with the concept of a definite compound.

857
MAGNETOCHEMISTRY OF THE HEAVIEST ELEMENTS. PART V. URANIUM TETRAFLUORIDE–THORIUM TETRAFLUORIDE SOLID SOLUTIONS. J. K. Dawson. J. Chem. Soc., 2889-92(1951) Nov.
The magnetic susceptibilities of solid solutions of UF_4 and ThF_4 have been measured over the temperature range 90 to 350°K, and at all dilutions the susceptibility of the U(IV) ion obeys the Weiss-Curie law. At infinite dilution the extrapolated susceptibility and the magnetic moment of U(IV) are close to the theoretical values predicted for a $5f^2$ electron configuration with the j-j type of coupling. This is in contrast to the corresponding oxide system in which urania is diluted with thoria, since the susceptibility and the magnetic moment of U(IV) at infinite dilution in that case correspond to theoretical values expected for a $6d^2$ electron configuration. (auth)

WASTE DISPOSAL

858
WHAT TREATMENT FOR RADIOACTIVE WASTES? John F. Newell and C. W. Christenson. Eng. News-Record 147, 37-8(1951) Nov.
Removal of Pu from laboratory and laundry waste waters is discussed. Treatment of waste waters at Los Alamos is cited as an example. A flow diagram for a waste-treatment plant is included.

ENGINEERING

859
Torpedo Experimental Establishment, Greenock (Great Britain)
THE WELDING OF THICK ALUMINUM ALLOY PLATES BY THE ARGON ARC PROCESS; PROGRESS REPORT ON THE FIRST YEAR'S WORK; by J. E. Chard and N. Macdonald. Jan. 1950. 15p. (ACSIL/ADM/50/228; STR-562; F²-3755-50)

860
Lewis Flight Propulsion Lab.
AUTOMATIC CONTROL SYSTEMS SATISFYING CERTAIN GENERAL CRITERIONS ON TRANSIENT BEHAVIOR; by Aaron S. Boksenbom and Richard Hood. June 1951. 45p. (NACA-TN-2378)
An analytical method is presented for the design of automatic controls that starts from certain arbitrary criterions on the behavior of the controlled system and gives those physically realizable equations that the control system can follow in order to realize this behavior. The criterions used are in the form of certain time integrals. General results are shown for systems of second order and of any number of degrees of freedom. Detailed examples for several cases in the control of a turbojet engine are presented.

861
Radiation Lab., Univ. of Calif.
MAKING PRECISE NON-METALLIC SPHERES; by A. J. Schwemin. Nov. 9, 1951. 9p. (UCRL-1560)
A method has been developed for making nonmetallic spheres precise to at least ±0.0001 in. quartz pieces, hand ground to roughly spherical shape, were whirled within an abrasive-lined cylindrical cavity by a tangential air stream and then hand-lapped in a hemispherical cavity

from about 0.1880 down to 0.1875 ± 0.0001-in. diam. In addition, the technique for drilling holes as small as 0.010 in. in the spheres has been perfected.

AEROSOLS

862
Bureau of Mines
FLOCCULATION OF AEROSOLS BY INTENSE HIGH-FREQUENCY SOUND; by H. W. St. Clair, M. J. Spendlove, and E. V. Potter. Mar. 1948. 28p. (BM-RI-4218)

HEAT TRANSFER AND FLUID FLOW

863
Argonne National Lab.
TEMPERATURE AND STRESS DISTRIBUTION IN SPHERES, RODS, TUBES, AND PLATES IN WHICH THE HEAT SOURCE IS WITHIN THE BOUNDARIES OF THE SOLIDS; by J. C. Carter. Sept. 7, 1951. 13p. (ANL-4690)

The equations for temperature distribution are developed for the most common geometrical configurations. These are treated with the assumptions that the heat generation is uniform per unit volume of material and that the thermal conductivity, coefficient of expansion, and modulus of elasticity remain constant. Temperature-distribution equations are substituted into the stress equations, and curves using dimensionless groups in the stress equations as coordinates are presented.

864
National Research Council of Canada
AN EXPERIMENTAL INVESTIGATION OF PROTECTION ACHIEVED BY SWEAT COOLING ON POROUS SURFACES ADJACENT TO NONPOROUS SURFACES; by E. Duncombe. Jan. 22, 1951. 54p. (MT-20, ATI-109881)

The process of sweat cooling is defined as one in which the coolant is forced from the cold side through pores in the material to be cooled, from which it issues as a protective layer on the hot side. This effect was investigated for a porous bronze cylinder, hot combustion gas being passed through the center and cooling air forced radially inward. The cylinder was continued in both up-stream and down-stream directions by nonporous bronze extensions. The variation of protection with coolant flow for various temperature differences and positions downstream on the cylinders was measured. A comparison with theoretical predictions was undertaken both on the basis of flat plate laminar boundary layer theory and fully developed turbulent pipe flow. The former yielded a predicted protection that was far too high, but the latter gave results that rapidly approached theoretical predictions as distance downstream increased. Higher temperatures at the extremities of the porous cylinder can be attributed partly to less favorable boundary layer conditions and partly to conductivity effects in the metal wall. (auth)

865
Langley Memorial Aeronautical Lab.
DESIGN, SELECTION, AND INSTALLATION OF AIRCRAFT HEAT EXCHANGERS; by George P. Wood and Maurice J. Brevoort. Issued July 1943. 146p. (NACA-ARR-3G31)

866
Lewis Flight Propulsion Lab.
INFLUENCE OF TUBE-ENTRANCE CONFIGURATION ON AVERAGE HEAT-TRANSFER COEFFICIENTS AND FRICTION FACTORS FOR AIR FLOWING IN AN INCONEL TUBE; by Warren H. Lowdermilk and Milton D. Grele. Aug. 23, 1950. 29p. (NACA-RM-E50E23)

867
Lewis Flight Propulsion Lab.
CORRELATION OF FORCED-CONVECTION HEAT-TRANSFER DATA FOR AIR FLOWING IN SMOOTH PLATINUM TUBE WITH LONG-APPROACH ENTRANCE AT HIGH SURFACE AND INLET-AIR TEMPERATURES; by Leland G. Desmon and Eldon W. Sams. Nov. 2, 1950. 28p. (NACA-RM-E50H23)

868
Western Reserve Univ.
HEAT CAPACITY OF METHANE ADSORBED ON TITANIUM DIOXIDE BETWEEN 50° AND 90°K; by E. L. Pace, D. J. Sasmor, and E. L. Heric. Oct. 1, 1951. 19p. (NYO-906)

An adiabatic calorimeter is briefly described. The heat capacity of the methane–titanium dioxide system between 55° and 90°K is presented. The heat capacity of the adsorbed methane is higher than any of the bulk phases. The interpretation of the results in terms of a reasonable model requires the separation of the measured heat capacity into a nonconfigurational contribution essentially characteristic of the adsorbed methane and a configurational contribution associated with the adsorbent resulting from the distribution of energy at the adsorption centers. The heat capacity–temperature curves point to the absence of any first order transitions in the temperature range studied. (auth)

869
Oak Ridge National Lab., Y-12 Area
TEMPERATURE VARIATION WITH SPACE AND TIME IN AN INFINITELY LONG CYLINDER CONCENTRIC WITH AN INTERIOR CYLINDER IN WHICH THERE IS A STEADY SOURCE OF HEAT; by T. Rubin. Dec. 29, 1950. 8p. (Y-F10-28)

A mathematical derivation is given for the following problem: For time $t \leq 0$ both concentric cylinders are at temperature equal to zero. Suddenly there is for time $t > 0$ a steady and uniform source of A units of heat/cm²/sec in the interior cylinder. Assuming no contact resistance between the two cylinders and no heat flow across the boundary of the exterior cylinder, the temperature as a function of space and time in the exterior cylinder is determined.

870
[Oak Ridge National Lab., Y-12 Area]
TRANSIENT TEMPERATURE AND THERMAL STRESS IN AN INFINITELY LONG SOLID CYLINDRICAL ROD WITH SURFACE TEMPERATURE CHANGING AT A CONSTANT; by J. G. Duffy. Oct. 27, 1950. 15p. (Y-F15-3)

871
INVESTIGATION OF CIRCULATION IN HIGH-PRESSURE STEAM BOILER TUBES. M. A. Styrikovich and G. E. Kholodovskiĭ. Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk, No. 4, 506-28(1951) Apr. (In Russian)

872
HYDRODYNAMIC THEORY OF VARIATIONS IN RATE OF BOILING OF LIQUIDS UNDER FREE CONVECTION. S. S. Kutateladze. Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk, No. 4, 529-36(1951) Apr. (In Russian)

873
THERMAL AND HYDRODYNAMIC SCALE-MODEL STUDIES OF THE FLOW OF AIR IN LARGE ROOMS (SPACE MODEL). E. V. Kudryavtzev. Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk, No. 8, 1178-87(1951) Aug. (In Russian)

874
DERIVATION OF DIMENSIONAL RULES FOR TYPES OF FLOW AND THEIR TECHNOLOGICAL APPLICATION. Erich Schwarz-Bergkampf. Acta Phys. Aust. 5, 123-8(1951) Nov. (In German)

Multiplication factors for various dimensionless constants and other factors involved in dimensional studies of heat transfer; pressure changes, etc., in laminar and turbulent flow are derived.

875
FLUID FLOW IN DUCTS WITH A UNIFORMLY DISTRIBUTED LEAKAGE. J. F. Holdsworth, F. W. Pritchard, and W. H. Walton. Brit. J. Applied Phys. 2, 321-4(1951) Nov.

An analysis of the problem is given for any power law relationship between flow rate and pressure gradient and between leakage rate and excess pressure in a duct. The results relate the pressure drop, inlet flow rate and outlet flow rate for a leaking duct to the pressure drop and flow rate in a similar leakless duct. It is shown that these quantities can be conveniently obtained using a nomogram involving a resistance constant and a leakage constant for the duct. Assumptions involved are discussed and a description is given of a model experiment which confirms the results of the theoretical treatment. (auth)

MATERIALS TESTING

876
Cornell Aeronautical Lab., Inc.
A RECORD OF CONFERENCE, SPONSORED BY THE MATERIALS PANEL OF PROJECT SQUID, IN WASHINGTON, D. C. ON 24 MAY 1950 ON FATIGUE OF METALS AT HIGH TEMPERATURES; H. J. Yearian, comp., Philip K. Porter, ed. May 24, 1950. 178p. (U-13983; Technical Report No. 21)

PUMPS

877
MODIFICATION IN DESIGN OF LABORATORY VACUUM PUMPS. Louis P. Cecchini and John F. Bronson. Rev. Sci. Instruments 22, 836-7(1951) Nov. (Laboratory and shop notes)

Simple modifications are suggested for the Cenco-Hyvac vacuum pump which simplifies the task of changing oil during regular maintenance routine. The modification consists in (1) extending the drain plug at the bottom of the oil reservoir, (2) installing a dip stick to measure the oil level, and (3) installing a tapped opening to refill the oil reservoir.

VACUUM SYSTEMS

878
Atomic Energy Research Establishment, Harwell, Berks (England)
VACUUM TECHNIQUE FOR BEGINNERS; by A. H. Turnbull. Aug. 23, 1951. 41p. (AERE-G/R-752)

The report is divided into five chapters. Chapter 1 discusses the principal types of vacuum pumps. Chapter 2 discusses the theory of gas flow and the basis for choosing particular types of pumps. Chapter 3 discusses the methods and instruments used in making vacuum measurements. Chapter 4 describes types of components for vacuum systems such as shaft seals, valves, and grease. Chapter 5 describes methods of leak detection for vacuum systems.

879
APPLICATION OF OPTICAL ABSORPTION IN THE FAR ULTRAVIOLET TO LEAK DETECTION IN VACUUM APPARATUS AND TO THE MEASUREMENT OF LOW PRESSURES. Jacques Romand, Vladimir Schwetzoff, and Boris Vodar. Vide, Le 6, 1046-51(1951) July-Sept. (In French)

An apparatus measuring absorption in the Schumann region (1850 to 1200 A) is illustrated and described. The use of the equipment in measuring air pressures down to 5×10^{-4} mm Hg and leaks, using benzene as a tracer, of 5×10^{-9} liter/sec is reported.

880
LABORATORY APPARATUS FOR DISTILLATION OF DIFFUSION-PUMP OIL. Azam and Ortel. Vide, Le 6, 1063 (1951) July-Sept. (In French)

A glass distillation apparatus of 2-liter capacity is described briefly. The qualities of minimum vapor pressure, oxidation resistance, and efficiency factor of a commercial oil were improved by distillation.

881
REALIZATION OF A RAREFIED ATMOSPHERE OF GIVEN CHARACTERISTICS. Paul Romann. Vide, Le 6, 1064-7 (1951) July-Sept. (In French)

The introduction of a small quantity of gas into a previously evacuated system to give a known pressure is often desired. A glass apparatus by which this may be accomplished is described. Absolute graduation in pressure is possible by a volumetric method similar to that used in McLeod gages.

WASTE DISPOSAL

882
Knolls Atomic Power Lab.
WASTE DISPOSAL; PROGRESS REPORT; SEPTEMBER, OCTOBER, NOVEMBER 1951; by KAPL Staff. [nd] 27p. (KAPL-649)

Experimental work is reported on the pilot incinerator for contaminated combustible solids, and data are given on liquid-waste processing in 1951. Specifications are given for construction of a production-type incinerator for contaminated combustible liquids. Experiments with various inorganic reducing agents attempting to retard the conversion of the Ru to the volatile form are reported. Effects of operating pressure and still-pot acid concentration on the decontamination factor are shown.

883
Johns Hopkins Univ.
CONTAMINATION OF METAL SURFACES BY I^{131} IN SOLUTION; FINAL REPORT; JUNE 1 TO JANUARY 1, 1951; by Albert P. Talboys. Apr. 1, 1951. (NYO-1573; JHUX-6)

This report describes the laboratory investigation of the uptake of radioiodine (I^{131}) from solution by metallic materials commonly used in drain systems. Chemisorption of the I^{131} is primarily responsible for contamination of the metals, and the most important factors involved are the type of metal, concentration of I^{131} in solution, time of contact, condition of surface, and pH of solution. Potential hazards resulting from disposal of I^{131} to drains were computed from the experimental results. They indicate that special care should be exercised to avoid contaminating exterior surfaces. However, retention of I^{131} by the interior surfaces of plumbing is not likely to reach hazardous proportions if very strong wastes are sufficiently diluted before disposal and if the active solutions are quickly and thoroughly flushed out of the system.

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

884
Battelle Memorial Inst.
PROPERTIES OF TIN OXIDE–BASE CERAMICS; by J. F. Quirk and C. G. Harman. Aug. 1, 1951. Decl. Nov. 9, 1951. 16p. (AECD-3285; BMI-78)

Various thermal and mechanical properties were measured for sintered tin oxide–matrix compacts which nominally were composed of 99 wt.% of tin oxide, SnO_2, and 1 wt. % of Zn oxide, ZnO. The tin oxide–matrix composition was similar in strength, at room temperature, to technical porcelains of the mullite or sillimanite type, but had far superior resistance to thermal shock and better strength at 1000°F. The tin oxide body might be expected to give good service under conditions of severe thermal shock and in an oxidizing atmosphere at temperatures up to 1500°F.

885
Naval Research Lab.
PREPARATION OF SILICONE COMPOUNDS FOR USE IN HIGH-TEMPERATURE ORGANIC FINISHES; by W. E. Weaver. Oct. 31, 1951. 25p. (NRL-3870)

The need for a finish able to withstand relatively high temperatures has resulted in an investigation of silicone polymer systems. The preparation of various silane monomers was studied by both the Grignard and direct methods. A number of alkyl silicones as well as many aryl-alkyl silicones were prepared using available chlorosilanes. The preparation of aryl-alkyl silicones directly from the Grignard reaction has also been investigated. Preliminary to the preparation of fluoro-aryl silicones (expected to be thermostable because of the inactivating effect on the phenyl ring by the fluorine atom), a number of aromatic bromo-fluoro-aryl compounds were prepared.

886
CERAMIC COMPOSITIONS. L. Bonnet. British Patent 653,980, May 30, 1951.

An abstract of the procedure covered by this patent appeared in Brit. Ceram. Abstracts, No. 5, abstr. 2442(1951) Sept.-Oct. and is reproduced here in its entirety.

This patent refers to materials of high electrical resistivity at high temperature and of satisfactory thermal conductivity and high spalling resistance, e.g., spark plugs. The material contains Al_2O_3, ZrO_2, $ZrSiO_4$, or TiO_2 as the principal constituent; the necessary firing temperature is reduced by the addition of 5 to 20% of a eutectic mixture of equal parts of $MgZrO_3$ and kaolin. The eutectic may be applied as a slip to the tips of corundum spark plugs.

887
STABILIZED ZIRCONIA, A PURE OXIDE REFRACTORY. L. H. Milligan. Brick & Clay Record 118, No, 5, 52(1951)

An abstract of this paper appeared in Brit. Ceram. Abstracts, No. 5, abstr. 2470(1951) Sept.-Oct. and is reproduced here in its entirety.

The superiority of stabilized ZrO_2 is noted; compared with other materials its maximum temperature of use is 2400°C as against 1870°C for Al_2O_3, and 1650°C for superduty fireclay. Pure-oxide refractories do not depend upon the development of a bonding glass phase; self-bonding takes place at high temperature, when a crystalline bond is formed, called a pure-oxide porcelain, which becomes the bond for coarse grain sizes of the same material and gives pure-oxide refractory bricks.

CORROSION

888
National Bureau of Standards
MECHANICAL AND CORROSION TESTS OF SPOT-WELDED ALUMINUM ALLOYS; by Fred M. Reinhart, Wendell F. Hess, Robert A. Wyant, Frederick J. Winsor, and Robert R. Nash. National Bureau of Standards and Rensselaer Polytechnic Inst. Dec., 1951. 74p. (NACA-TN-2538)

Corrosion behavior of spot-welded aluminum-alloy (alclad 24S-T3, 24S-T3, alclad XB75S-T6, XB75S-T6, and R-301-T6) panels of varying weld quality was determined. Tidewater and weather-exposure tests were made and the results were evaluated largely in terms of distribution of corrosion products and effects on weld strength. Metallographic examinations of several of the alloys were also made to determine the extent and type of corrosion attack associated with various welding and exposure conditions.

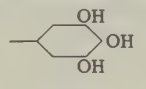
889
New York Univ.
THE RATE OF CORROSION OF SILVER IN FERRIC PERCHLORATE SOLUTIONS (thesis); by Cecil V. King and Frances S. Lang. Sept. 1, 1951. 24p. (NYO-630)

Silver dissolves much more slowly in ferric perchlorate and nitrate than in ferric sulfate solutions. A detailed study of the rate in perchlorate solutions has been made, with the effect of concentration of ferric, ferrous, and silver ions, of other salts including sulfates, of stirring speed, temperature, and electrical polarization. Two factors are responsible for the difference in rates: (a) silver perchlorate is more strongly adsorbed on silver than silver sulfate is, and (b) a sulfato-ferric complex ion reacts more rapidly than the normal hydrated ferric ion. Spectrophotometric evidence is given for the existence of the sulfato-ferric ion. (auth)

GEOLOGY AND MINERALOGY

890
Institute for the Study of Rate Processes, Univ. of Utah
COLLECTOR-DEPRESSANT EQUILIBRIA IN FLOTATION; II. DEPRESSANT ACTION OF TANNIC ACID AND QUEBRACHO; by George A. Last and Melvin A. Cook. Oct. 1, 1951. 21p. (AECU-1762; Technical Report No. IV)

An experimental investigation of the systems galena–amyl xanthate–tannic acid and galena–amyl xanthate–quebracho was carried out, and the data have been interpreted by the single-site model for hydrolytic (free acid) collector–depressant adsorption. These depressants were found to have two surface-active groups which are capable of adsorbing on a galena surface, namely the carboxyl and phenolic groups. Apparently not all the phenolic groups are active as depressants, but evidently only the undissociated radical



is capable of adsorbing on galena. Evidence is presented which indicates that tannins in the colloidal form, i.e., as micelles, are ineffective as depressants for galena. (auth)

891
Minnesota Univ.
ANNUAL REPORT FOR JULY 1, 1950, TO JUNE 30, 1951; PART II; by John W. Gruner. Issued Nov. 1, 1951. 27p. (RMO-837)

The origin of U deposits in the Upper Triassic Shinarump Formation in the Colorado Plateau is most likely deposition by flowing cold waters. The U in asphaltite and carbonized wood has been stationary since it became absorbed in Triassic time and these U deposits occur in Triassic "stream channels." Secondary deposition by circulating ground waters occurs.

892
STUDIES ON THE PREPARATION OF ZIRCONIA FROM FORMOSAN ZIRCON SANDS. S. Ishibashi. J. Japan. Ceram. Assoc. 59, 138(1951).

An abstract of this paper appeared in Brit. Ceram. Abstracts, No. 5, abstr. 2319(1951) Sept.-Oct. and is reproduced here in its entirety.

The finely ground zircon was fused with NaOH and Na_2O_2 and then extracted with water; the residue was then treated with HCl, evaporated, and dried at 100°C for sev-

eral hours. After removal of the SiO_2, the solution of $ZrCl_4$, containing $FeCl_3$ and $TiCl_4$ as impurities, was almost neutralized with NH_4OH and boiled; SO_2 was then bubbled through the solution to precipitate $Zr(OH)_4$. The Zr was ultimately recovered as the basic sulfate, and ZrO_2 of 99% purity was obtained.

METALS AND METALLURGY

893

Westinghouse Atomic Power Div.
CREEP OF COPPER UNDER DEUTERON BOMBARDMENT; by Warren F. Witzig. Oct. 1951. Decl. Dec. 26, 1951. 59p. (AECD-3290; WAPD-43)

The creep rate of Cu under deuteron bombardment was investigated. The experiments reported consist of measurements of the second-stage creep rate of a copper wire under deuteron bombardment at a temperature of 260°C and a loading of 10,000 psi. Within the precision of the experiment, estimated to be ±20%, the creep rate during and after bombardments of 10 to 20 hr duration was unchanged from the creep rate preceding bombardment. Thus, apparently the type of considerations involved by solid state theory is confirmed and creep rates should not be expected to increase for all metals under bombardment as was feared a few years ago. (auth)

894

Institute for the Study of Rate Processes, Univ. of Utah
COLLECTOR-DEPRESSANT EQUILIBRIA IN FLOTATION; I. INORGANIC DEPRESSANTS FOR METAL SULFIDES; by George A. Last and Melvin A. Cook. Oct. 1, 1951. 22p. (AECU-1761; Technical Report No. III)

The "bubble-pickup" method of Cooke and Digre (Am. Inst. Mining Met. Engrs. Tech. Pub. 2606, 2607, Mining Eng. No. 8(1949)) was employed to obtain comprehensive equilibrium data for the system K–N amyl xanthate–sodium sulfite–galena at 25°C. The "ionic" mechanism of Wark (Proc. Australasian Inst. Mining & Met. (1938)) and Wark and Cox, Am. Inst. Mining Met. Engrs. Tech. Pub., 659, (1936)) was thoroughly investigated and found inadequate in accounting for the experimental results obtained in this and other similar investigations. A free-acid-collector–free-acid-depressant single-site mechanism was developed based on the Cook hydrolytic adsorption theory and found to give a complete and self-consistent correlation of the experimental results of this study together with results of investigation of sixteen other similar systems studied by Wark.

895

Illinois Univ.
DIFFUSION IN INDIUM NEAR THE MELTING POINT; by Roger E. Eckert and H. G. Drickamer. [nd] 20p. (AECU-1767)

Diffusion coefficients for the systems Tl^{204}-In and In^{114}-In have been measured in the solid state and in the neighborhood of the melting point. The measurements were made in both polycrystalline masses and in single crystals. For the polycrystalline samples a rapid, but not discontinuous, rise in the diffusion coefficient occurred about 0.5°C below the melting point. In the Tl^{204}-In system using a single crystal the rise in D occurs just below the melting point. This indicates grain boundary melting in the polycrystalline sample. For the In^{114}-In diffusion in a single crystal the rapid rise still occurred well below the melting point, indicating that increasing lattice disorder also contributes to the increase in D. (auth)

896

Institute for the Study of Rate Processes, Univ. of Utah
THE HIGH TEMPERATURE HIGH PRESSURE OXIDATION RATE OF COPPER; by W. Martin Fassell and William McKewan. June 15, 1951. 13p. (AECU-1772; Technical Report No. I)

Observations were made of the oxidation of 56 samples of full-annealed electrolytic sheet Cu in oxygen at 600 and 800°C. Total oxygen pressure was varied from 14.7 to 400 psi. Typical curves showing the increase of weight with time at 800°C are shown. The entire series of rate constants at 800°C obtained from the rate curves are plotted vs. oxygen pressure. This plot indicates that the oxidation rate of pure Cu in oxygen is independent of pressure above 1 atm. The literature on the oxidation of Cu is reviewed briefly.

897

Institute for the Study of Rate Processes, Univ. of Utah
A SIMPLE APPARATUS FOR THE DETERMINATION OF THE TRUE SURFACE AREA OF METAL SAMPLES; by George Richard Hill and John R. Weeks. Nov. 1, 1951. 10p. (AECU-1776; Technical Report No. VI)

The purpose of the present work was to develop a simplified electric circuit to be used to determine the total surface area and the surface roughness factor for initial corrosion rate studies. The basis of the circuit is the use of a capacitor of known capacitance placed in series with the cell during a portion of the rising or falling sections of the E-t curve. The variance of E with t is followed using a sensitive potentiometer that measures the cathode potential against that of a standard reference electrode (saturated calomel). The capacitor is placed in the circuit only during a known potential change, ΔE. $\Delta\Gamma$ can then be determined directly by measurement of the charge on the capacitor. (auth)

898

Battelle Memorial Inst.
THE SURFACE REACTION OF NITROGEN WITH BETA ZIRCONIUM AND THE DIFFUSION OF NITROGEN IN THE METAL; by M. W. Mallett, E. M. Baroody, H. R. Nelson, and C. A. Papp. Dec. 12, 1951. 29p. (BMI-709(Rev.))

A study has been made of the nitrogen-zirconium reaction in the temperature range of 900 to 1600°C at one atmosphere pressure. Examination of the data showed that the reaction follows a parabolic law after an initial deviation. The parabolic rate constant has been calculated in square centimeters per second to be: $k = 8.5 \times 10^5 e^{-67,500/RT}$, in which 67,500 cal/mole is the activation energy, within a probable error of ±1,500 cal/mole. Diffusion-rate calculations based on a special solution of the usual diffusion equation gave a diffusion coefficient, $D_\beta = 8.06 \times 10^{-2} e^{-36,400/RT}$ cm²/sec. The energy of activation of diffusion, 36,400 cal/mole, has a probable error of ± 2100 cal/mole. (auth)

899

Langley Aeronautical Lab.
A STUDY OF SLIP FORMATION IN POLYCRYSTALLINE ALUMINUM; by Aldie E. Johnson, Jr., and S. B. Batdorf. Dec. 1951. 18p. (NACA-TN-2576)

Experimental results are presented which shed light on the assumptions that have been made in several attempts to bridge the gap between the physical and mathematical theories of plasticity. The experimental results are compatible with, but do not necessarily verify, the conception that plastic deformation in strain-hardening materials is primarily due to slip. Slip was observed to occur first in a few isolated grains and to spread gradually to adjacent grains as the stress level increased. The occurrence and spread of the slip lines suggested independent behavior of randomly oriented grains at low stress levels with interaction among grains increasing as the stress level increased.

900
NEPA Div.
SUMMARY REPORT ON THE SOLUBILITY OF METALS AND ALLOYS IN PURE BISMUTH AT TEMPERATURES UP TO 2200°F; by John F. Collins. Apr. 12, 1951. 25p. (NEPA-1800)

A survey of high-temperature metals and alloys was made to determine their suitability as containing materials for liquid bismuth. The temperature range of 900 to 2200°F was investigated using the agitated-capsule technique. Mo, Fe, and the Cr-Fe alloys exhibited the lowest solubility and the least attack by Bi. Ni alloys with Bi and Ni bearing alloys had relatively high solubility values at temperatures above 1350°F. The solubility rate appears to decrease with time but saturation conditions were not reached in 500-hr test periods. Some special tests of ceramics in Bi and group of service tests are summarized in the appendix.

901
NEPA Div.
THE SOLUBILITY OF METALS AND ALLOYS IN LEAD-BISMUTH EUTECTIC AT TEMPERATURES UP TO 2200°F; by John F. Collins and H. R. Stephan. Apr. 12, 1951. 14p. (NEPA-1803)

A survey of readily available high-temperature alloys and metals was made with respect to their solubility in lead-bismuth eutectic. The temperature range of 900 to 2200°F for times up to 100 hr was investigated. Selected stainless steels, special alloys, and refractory metals were tested by the agitated-capsule method. Molybdenum, niobium, tantalum, and ingot Fe are the most resistant to corrosion by Pb-Bi eutectic. The 18-8 type stainless steels can be used to contain lead-bismuth at temperatures up to 1400°F without excessive attack on the containing material. Type 446 chrome-iron alloy is a better containing material than the 18-8 alloys for applications where structural considerations are not a prime factor. Evidence of selective solubility of Ni and Mn makes the high-Ni alloys undesirable.

902
Armour Research Foundation
THE BEHAVIOR OF TEMPERED MARTENSITE IN THE V-NOTCH CHARPY TEST; by M. Baeyertz, W. F. Craig, Jr., and J. P. Sheehan. Oct. 16, 1951. 44p. (NP-3511; Report No. 31 (Technical Report))

Basic V-notch Charpy behavior patterns of tempered martensite at different hardness levels and factors affecting the maximum-energy and transition-temperature components are summarized. Specimens were austenitized, quenched to form martensite, and tempered for 1 hr. At a given temperature, a rapid initial hardness drop was followed by a gradual softening. With progressive martensite tempering, 0.40% C steels with 34 to 50 Rockwell C hardness exhibited a change from brittle to ductile fracture accompanied by a rise in absorbed energy. Energy curves reached a maximum level above the transition and remained essentially constant thereafter. Limits of the transition-temperature range depended on selected criteria, usually expressed as percentages of the apparently brittle fracture area. The value of 80% maximum energy which coincided with transitions at 0% brittle fracture was chosen as the index for energy-transition determinations. Maximum-energy values were higher for longitudinal than transverse specimens; were independent of C content for martensites tempered to the same hardness; were higher for 0.40% C steels from large commercial ingots than from 65-lb ingots of the same grade; and were not appreciably influenced by austenite coarsening, homogenization, or Cr, Ni, Mn, and Mo contents. Transition temperatures were equal or lower for transverse than for longitudinal samples; were higher for 0.40% C steels made from large than from small ingots and having equal hardness above 35 Rockwell C and Mo/P ratios above 5; were not influenced by Cr, Ni, or Mn contents but decreased with increased amounts of Mo; increased with as-austenitized grain-size coarsening between 25 and 50 Rockwell C; and were lower for 0.40% C martensite tempered to 30 to 35 Rockwell C than for C percentages above or below this level. Temperature brittleness was avoided through a proper selection of C and P contents and quenching conditions. 31 figures.

903
Dow Chemical Co.
DEVELOPMENT OF HIGH-TEMPERATURE MAGNESIUM ALLOYS WITH SPECIFIED NEUTRON CROSS SECTION (Final Technical Report); by [T. E. Leontis]. July 19, 1951. 36p. (NP-3535)

From a study of Mg-Th and Mg-Th-Zr alloys in both the sand-cast and extruded states over a wide composition range, sand-cast Mg-Th-Zr alloys were found to have a combination of fine grain size, high strength and ductility, and high resistance to creep at temperatures up to 600°F. The alloy recommended for possible commercial development is Mg + 3Th + 1Zr. Metallurgical data on test alloys are included.

904
British Aluminium Co., Ltd., London (England)
LIGHT METALS BULLETIN; VOL. 12, NO. 10, 1950. May 12, 1950. 46p. (NP-3545; F²-4358-50; R-1585-50)

A survey of current literature on the production, fabrication, and uses of aluminum and light alloys, and on related scientific and technical subjects.

905
Carbide and Carbon Chemicals Co., Y-12
SELECTED PHYSICAL PROPERTIES OF TANTALUM IN THE TEMPERATURE RANGE 100 to 1000°C; by Frances L. Sachs. Dec. 18, 1951. 11p. (Y-B4-51)

This bibliography lists references to 28 papers on the density, heat capacity, thermal conductivity, and vapor pressure of tantalum. References include both published literature and AEC reports. Brief notes on most of the references are given.

906
FORMABILITY OF TITANIUM. O. A. Wheelon. Iron Age 168, 140-3(1951) Dec. 13.

An investigation of the formability and machinability of commercially pure Ti shows that in general it forms like Mg and machines like stainless steel. Most of the forming must be done hot. Studies included use of stretch forming, the Hydropress, power breaks, rolls, and planishing hammers.

907
MECHANISM OF GRAIN REFINEMENT IN ALUMINUM ALLOYS. F. A. Crossley and L. F. Mondolfo. J. Metals (New York) 3, 1143-8(1951) Dec.

The mechanism of grain refinement by the addition of small amounts of Ti, Mo, Zr, W, and Cr to Al was investigated. The results indicate that the grain refinement is caused by the peritectic reaction which, by transforming the intermetallic compound into crystals of Al solid solution, seeds the melt with nuclei above the freezing point of Al. (auth)

908
CONSTITUTION OF TITANIUM-ALUMINUM ALLOYS. H. R. Ogden, D. J. Maykuth, W. L. Finlay, and R. I. Jaffee. J. Metals (New York) 3, 1150-5(1951) Dec.

Aluminum has been found to be soluble in α titanium to about 26%, and to raise the temperature range of transformation from α to β. Two intermediate phases exist in the system, a new face-centered tetragonal phase, designated as γ, which occurs between 34 and 46% Al, and $TiAl_3$.

Metallographic and X-ray diffraction data were used to determine the diagram. (auth)

909

INVESTIGATION OF PLASTIC AND OTHER PROPERTIES OF ALLOYS IN THE IRON-NICKEL-TANTALUM SYSTEM. K. A. Osipov. Izvest. Akad. Nauk S.S.S.R. Otdel. Tekh. Nauk, No. 6, 848-51(1951) June. (In Russian)

Specific conductivity, hardness, and flexibility of alloys in certain regions of the Fe-Ni-Ta system are presented. 7 figures.

910

GRINDING METHODS EVOLVED FOR TITANIUM. J. Metals (New York) 3, 1128-9(1951) Dec.

Results on the precision grinding of Ti and Ti alloys are tabulated. The grinding ratio G was found to be between 2 and 3. In finish grinding of the Ti alloys, it was found that increasing the unit crossfeed from 0.010 to 0.025 in. approximately doubled the profilometer readings. There was no difference in the grinding characteristics for the parallel and perpendicular directions of rolled Ti.

911

RECOVERY OF VANADIUM FROM TITANIFEROUS MAGNETITE. Sandford S. Cole and John S. Breitenstein. J. Metals (New York) 3, 1133-7(1951) Dec.

A process developed in the laboratory and carried through the pilot-plant for the recovery of vanadium values from MacIntyre magnetite containing 10% TiO_2 and 0.4% V is described. Grinding the ore to pass 200 mesh screen is required. The addition of 3 to 5% NaCl and 6 to 10% Na_2CO_3 is made and roasting is under oxidizing conditions at 910 to 930°C. The effective release in soluble form of 75 to 90% of the vanadium contained and 50% chromium was accomplished by this roast.

The leaching of the roaster discharge in the presence of stack gases fixed the aluminum values in the leach cake. Conditions for precipitation of a fast filtering vanadium oxide by use of nuclei at a pH of 2.5 were established. The precipitation of chromium hydroxide after reduction of the solution with SO_2 at a pH of 6.5 to 7.0 yielded a sodium sulfate-sodium chloride liquor from which pure sodium sulfate was crystallized and the sodium chloride brine was returned to process. Recovery of vanadium and chromium values from the solutions was over 99 effective. (auth)

912

IMPREGNATION OF THE SURFACE LAYERS OF STEEL WITH CERIUM. N. T. Gudtsov and G. N. Dubinin. Izvest. Akad. Nauk S.S.S.R., Otdel. Tekh. Nauk, No. 4, 565-75(1951) Apr. (In Russian)

Steel containing various percentages of carbon has been impregnated with Ce at 1000 to 1100°C. The resulting structure has been examined microscopically and by x-ray diffraction. Certain changes are shown to be necessary in the Fe-Ce phase diagram. No heat resistance was added to the steel by the Ce treatment. 24 figures.

913

TITANIUM. G. L. Miller. Ind. Chemist 27, 483-91(1951) Nov.

A review of methods of producing Ti metal is given. The iodide process uses thermal decomposition of TiI_4 to Ti metal and I. In the Kroll process $TiCl_4$ is reduced to metallic Ti by the addition of the chloride to molten Mg contained in a steel reaction vessel filled with inert gas such as He or A. The Mg and the chloride are removed either by a powder-metallurgy technique or by a melting technique using temperatures up to 950°C. Details of these processes are given and the equipment used is illustrated. Data on purity, consolidation of Ti into usable forms, techniques of fabrication, and properties of metallic Ti are shown.

914

LITHIUM AND ITS COMPOUNDS. Rodney N. Hader, Richard L. Nielsen, and Myron G. Herre. Ind. Eng. Chem. 43, 2636-46(1951) Dec.

The history of the uses and production of Li introduces a discussion of diverse commercial applications and improved methods of extracting Li from its ores, developed during the past 15 years. Ceramics, lubrication, metallurgy, and air conditioning are mentioned as industries sharing in consumption of the constantly expanding output of Li and its compounds. Flow sheets for the production of Li products from spodumene, and production of lithium carbonate, lithium hydroxide, and lithium chloride are included. Data on chemical properties of Li are presented graphically and discussed. 26 references.

PHYSICS

915

Battelle Memorial Inst.

THERMAL CONDUCTIVITY OF BORON CARBIDE FROM 100°C TO 800°C; by H. W. Deem and C. F. Lucks. Dec. 10, 1951. 10p. (BMI-713)

The thermal conductivities of three boron carbide specimens with densities from 1.90 to 2.5 g/cm^3 were measured over a temperature range from 100 to 800°C. Thermal conductivities decreased with temperature. Measured values ranged from 0.158 to 0.284 w/cm/°C at 100°C and from 0.082 to 0.146 w/cm/°C at 800°C, the variation at a given temperature being a function of density and composition. (auth)

916

Engineering Research Inst., Univ. of Michigan

UTILIZATION OF THE GROSS FISSION PRODUCTS; PROGRESS REPORT...; by L. E. Brownell, L. C. Anderson, H. J. Gomberg, J. J. Martin, W. W. Meinke, L. Thomasen, E. T. Vincent, and R. A. Wolfe. Aug. 31, 1951. 94p. (COO-86; Progress Report No. 1)

The project organization is described, followed by a description of the laboratories and equipment. The following research problems are described including a review of the pertinent literature: Effects of Radiation on Combustion Engine Performance, Effects of Radiation on Chemical Reactions, Effect of Radiation on Foods. Preliminary experimental results are reported for the subproject, Effect of Radiation on Foods. The most promising results have been obtained with irradiated milk and meat. It was found possible to preserve these perishable foods for more than three weeks at 77° F after a γ irradiation of 2,400,000 r. Molds appear to be the most difficult microorganism to destroy. Enzymes have greater resistance of irradiation than microorganisms.

917

Radiation Lab., Univ. of Calif.

SUMMARY OF THE RESEARCH PROGRESS MEETING OF SEPTEMBER 13, 1951; by S. Shewchuck. Oct. 25, 1951. 12p. (UCRL-1479)

Data on the neutron-deficient isotopes of Cm are presented. An abstract of a paper prepared by Dr. W. H. Barkas entitled "Observations on the Grain Density Law for Nuclear Emissions [sic]" is included. New experimental results of electron-electron scattering determined with nuclear emulsions are given. Preliminary results of analysis and counting of mesons in a study of the production of mesons as a function of atomic number, using Be, C, Al, Cu, Ag, and Pb, are included.

918
Radiation Lab., Univ. of Calif.
COMMENTS ON THE RADIATION FROM AN ELECTRON IN A MAGNETIC FIELD; by D. L. Judd, J. V. Lepore, M. Ruderman, and P. Wolff. Dec. 6, 1951. 3p. (UCRL-1599)

Quantum corrections to previously published data on radiation from electrons in a magnetic field are presented.

919
RELATIONSHIP BETWEEN THE EXTINCTION COEFFICIENT AND THE PARTICLE SIZE. Horace E. Rose. Nature 168, 784-5(1951) Nov. 3.

An improved method for experimental determination of the relationship between the extinction coefficient and the particle size for spherical bodies having diameters less than 50 μ is described. For particles of size up to 25 μ diameter, spheres of fused powdered glass and polystyrene are used; a desert sand and a silica sand are used for particles of larger size. Glass and sand powders are sized within reasonably close nominal limits of size by repeated levigation, the fractions are then submitted to sedimentation in a photoextinction apparatus, and a curve of $\ln I_0/I$ is plotted against the corresponding Stokes's diameter obtained, I_0 and I being the incident and emergent light intensities, respectively. From this curve are calculated the mean size and the size limits of the sample, and also the increment of $\ln I_0/I$ due to the material in this size range. The approximate weight of the material, mainly of size less than 2 μ not removed by levigation, is computed from the curve and an appropriate correction to the concentration of the suspension determined. The substitution of these corrected values in the equation of light transmission through a suspension of particles allows the calculation of the corresponding extinction coefficient, K_e. The extinction coefficient for the plastic spheres is determined without recourse to corrections, the diameter as obtained from an electron photomicrograph being used.

920
EXPERIMENTS WITH AUDIOFREQUENCIES ON SUPERCONDUCTORS. B. Serin, C. A. Reynolds, J. R. Feldmeier, and M. P. Garfunkel. Phys. Rev. 84, 802-5(1951) Nov. 15.

Experiments are described in which alternating and direct currents are superimposed on tin wires in the superconducting state. As the amplitude of the a-c is increased, the average p.d. goes through a maximum and approaches an asymptotic value. The experimental curves agree with calculated curves for low frequency a-c (<50 cps). However, as the frequency is increased the curves change in character. The maxima increase in height and occur at large values of the a-c. It is shown that this anomalous behavior can be traced to the a-c skin effect, and it is concluded that experiments of this type are not suitable for a determination of the relaxation time in the phase transition from the superconducting to the normal states. (auth)

921
PARAMAGNETIC SALTS FOR VERY LOW TEMPERATURES. M. J. Steenland. Nederland. Tijdschr. Natuurk. 17, 311-23(1951) Nov. (In Dutch)

A general discussion is presented, with data taken from the published literature, of the properties of various paramagnetic salts by which temperatures near the absolute zero have been obtained. 20 references.

ASTROPHYSICS

922
THE AGE OF THE ELEMENTS. Richard L. Burling. Phys. Rev. 84, 839-40(1951) Nov. 15.

The interpretation of figures quoted as upper limits for the "age of the sun," "age of the elements," "age of matter," "age of the earth," etc. is discussed. The meaning of "isolation" of the earth's crust is considered, and it is noted that Holmes' figure of 3.35×10^9 yr (Nature 163, 453 (1949)) is often misinterpreted as representing the age of the earth rather than the age of the sial crust. Many of these ages can be shown not to conflict with Urry's hypothesis of the earth's history (Trans. Am. Geophys. Union 30, 171(1949)).

COSMIC RADIATION

923
Cosmic Ray Lab., Univ. of Puerto Rico
A COSMIC RAY MULTITELESCOPE AND HODOSCOPE UNIT; by A. Cobas, R. Arce, and J. Garcia de la Noceda. [nd] 18p. (AECU-1780)

A cosmic-ray multitelescope and hodoscope unit has been designed to measure the azimuthal and zenithal variations of the electronic component of the cosmic radiation at geomagnetic latitude 29° N. Various telescopes are oriented at fixed zenith angles and mounted on wheels on a leveled platform so that the azimuthal angle can be changed as desired. The circuits are described in detail.

924
Syracuse Univ.
A STUDY OF DENSITY DISTRIBUTION AND DETECTION PROBABILITIES OF EXTENSIVE COSMIC RAY SHOWERS; SPECIAL REPORT; by Fritz E. Froehlich. Nov. 6, 1951. 32p. (NYO-976)

In preparation of an experiment to study the core structure of extensive air showers, the total number of electrons at an altitude of 10,700 ft in air showers of energies between 10^{13} and 10^{17} ev has been evaluated according to the formula of Jánossy and Messel, but with corrections for ionization losses and extended to electron energies of $\frac{1}{10}$ of the critical energy in air. With these figures, and with a re-evaluation of the lateral distribution function using the Bethe approximation and three successive approximations given by Molière, the electron densities for showers in the foregoing energy range has been plotted against the distance from the core. A comparatively simple counter arrangement has been devised which makes possible the location and classification in three energy intervals of the cores of extensive showers. The design and tests of a hodoscope circuit which forms part of the core analyzer are described. (auth)

925
Rochester Univ.
EMULSION CLOUD CHAMBER STUDY OF A HIGH ENERGY INTEGRATION IN THE COSMIC RADIATION; by M. Kaplon, B. Peters, and D. M. Ritson. Oct. 23, 1951. 13p. (NYO-3031)

A new technique is described for studying high-energy interactions utilizing photographic emulsions as detectors. A detailed study has been made with this technique of one very high-energy mixed shower. Evidence is obtained for the multicore structure of the soft component at depths of several radiation lengths in this mixed shower, along with the existence of a finite lifetime for the decay of the neutral π meson into two photons of the order of 1×10^{-14} sec. (auth)

926
THE FREQUENCY OF PENETRATING SHOWERS OF MESONS. Ch. Terreaux. Helv. Phys. Acta 24, 551-86 (1951) Nov. 20. (In French; see also NSA 4-488 and 4-5244)

The probability of production of penetrating meson showers is calculated on the hypothesis of pure plural production. The cross section for emission of a meson by a nucleon of incident energy E losing energy ϵ by collision is considered analogous to the law of deceleration of an electron by radiation, i.e., $\Phi(\epsilon,E)\, d\epsilon = \Phi(\epsilon/E)\, d\epsilon/E$. For

the particular case where Φ is of the first power in (ϵ/E) the fluctuations in the size of showers have a Poisson distribution. The hypothesis of plural production determines probabilities corresponding well with experience even in the case of showers of 30 or 40 mesons. The percentage of protons calculated according to this hypothesis also agrees with experiments. The probability of shower production by an incident meson is calculated.

927

THE SIGNIFICANCE OF THE ABSENCE OF PRIMARY ELECTRONS FOR THEORIES OF THE ORIGIN OF THE COSMIC RADIATION. T. M. Donahue. Phys. Rev. 84, 972-80(1951) Dec. 1.

Electrons of energy above 5 bev appear to constitute less than 0.4% of the primary cosmic radiation incident on the earth. An analysis of acceleration mechanisms reveals that no distinctions can readily be made in acceleration per se on the basis of sign of charge or mass. The absence of high-energy electrons must be explained on the basis of selective absorption. Bremsstrahlung collisions in the galaxy or the solar system and radiation caused by motion in galactic or local magnetic fields are inadequate to account for the large absorption of electrons compared with heavy particles. In collisions between energetic electrons and thermal photons, losses approaching the total electron energy occur. An analysis of such collisions reveals that if cosmic rays are confined to the solar system these collisions are so frequent that no electrons should be present at energies higher than 5 bev. The photon density is too low in interstellar space to cause a similar removal of electrons there. These results favor the solar or stellar origin theories of the cosmic radiation. (auth)

928

INTENSITIES OF HEAVY COSMIC-RAY PRIMARIES BY PULSE IONIZATION CHAMBER MEASUREMENTS. James A. Van Allen. Phys. Rev. 84, 791-7(1951) Nov. 15.

The results of two rocket flights of electron-collection pulse ionization chambers above the atmosphere are summarized and discussed. It is shown that the data provide limiting information on the absolute intensities of the heavy nuclei in the primary cosmic radiation. Additional confidence in the photographic emulsion estimates of these intensities by other workers is provided by the consistency of their results with the entirely independent ionization chamber measurements. (auth)

929

PROTON-MESON ANALYSIS OF THE COSMIC RADIATION AT 3.4 KILOMETERS. Charles E. Miller, Joseph E. Henderson, David S. Potter, and Jay Todd, Jr. Phys. Rev. 84, 981-6(1951) Dec.

A magnetic cloud chamber has been used along with an appropriate arrangement of coincidence and anticoincidence counters to photograph tracks of those charged particles at 3.4 km altitude having ranges of 0.5 to 5, 5.5 to 15, and 15 to 25 cm in lead. An additional 2.5 cm lead was used above the chamber to remove showers. Plotting in each case the distribution in momentum of positive and negative particles there is shown a clear resolution into protons and mesons. It is found that about twice as many protons as mesons stop in lead at ranges between 2.5 and 7.5 cm lead. The meson intensity (differential range intensity) is found to be $6.1 \pm 0.06 \times 10^{-8}$ particles per (g sec sterad) of air at 60 g air range and $12.0 \pm 1.0 \times 10^{-8}$ at 125 g air range. (auth)

930

THE RELATIVE INTENSITY OF COSMIC RAYS AT SEA LEVEL AT GEOMAGNETIC LATITUDES 56.8 AND 83.0. D. C. Rose, W. Heikkila, and E. Ford. Phys. Rev. 84, 986-90(1951) Dec. 1.

During the summer of 1950 two cosmic-ray counter telescopes were exchanged between Ottawa (geomagnetic latitude 56.8°N) and Resolute (geomagnetic latitude 83.0°N) in such a way that an accurate comparison of vertical intensities could be made. When all corrections were made there remained a difference in intensity of $1.76 \pm 0.75\%$. No difference would be expected with the absorbers used (14½ in. of lead) at latitudes so high above the "knee." Arguments are presented to show that the difference is probably due to mesons produced by a group of field-sensitive primaries and scattered into the telescope. This group of primaries could come from directions with large zenith angles, which would be allowed at Resolute but excluded at Ottawa. (auth)

ELECTRICAL DISCHARGE

931

THE DRIFT VELOCITIES OF MOLECULAR AND ATOMIC IONS IN HELIUM, NEON, AND ARGON. John A. Hornbeck. Phys. Rev. 84, 615-20(1951) Nov. 15.

Drift velocity measurements as a function of E/p_0, the ratio of field strength to normalized gas pressure, are presented for atomic and molecular ions of He, Ne, and A in their respective parent gases. Identification of the molecular ions is based upon the time resolution of the apparatus and the dependence of ion concentration on pressure, applied voltage, and gas purity. Extrapolation of the low field measurements to zero field yields mobility values for atomic ions, $\mu_0(He^+) = 10.8$ cm^2/v sec, $\mu_0(Ne^+) = 4.4$, and $\mu_0(A^+) = 1.63$ in good agreement with theory: Massey and Mohr compute $\mu_0(He^+) = 11$, and Holstein gives $\mu_0(Ne^+) = 4.1$ and $\mu_0(A^+) = 1.64$. Drift velocity data at low field for the molecular ions agree within experimental error with data of Tyndall and Powell (He), and Munson and Tyndall (Ne and A), which they assigned to atomic ions. A qualitative description in terms of ion-atom interaction forces is given for the observed field variation of the atomic ion drift velocities up to high E/p_0. (auth)

932

ELECTRON CURRENT CONTROL IN ARC DISCHARGE STUDIES. Raymond L. Murray. Rev. Sci. Instruments 22, 843(1951) Nov. (Laboratory and shop note)

Experiments performed to study the electron current control of arc discharges in magnetic fields show that the fraction of the total current that enters the arc chamber is strongly variable with the magnetic-field intensity, gas pressure, and cathode temperature. Thus, the regulation of total current fails to provide a standard electron current for studying the effects of arc variations, and can lead to misinterpretation of data. A method is also described which shows how the internal current of the chamber can be regulated within the range of stability of the arc.

ELECTRONS

933

THE RADIATION FROM AN ELECTRON MOVING IN A UNIFORM MAGNETIC FIELD. G. Parzen. Phys. Rev. 84, 235-9(1951) Oct. 15.

The radiation from an electron moving in a uniform magnetic field is investigated quantum mechanically. Reasons are given for expecting deviations from the classical calculations at electron energies of about 100 Mev in the presence of a magnetic field of 10^4 gauss. The quantum-mechanical calculation is carried through and is compared with the classical calculation. Although the deviations are considerable, it is explained why the experiments of Elder Langmuir, and Pollock, Phys. Rev. 14, 52(1948) with the G. E. synchrotron would not detect them. (auth)

GASES

934

Illinois Univ.

SELF DIFFUSION IN CO_2 AT MODERATE PRESSURES; by K. D. Timmerhaus and H. G. Drickamer. [nd] 9p. (AECU-1745)

Diffusion data are presented for the system CO_2-$C^{14}O_2$ over a pressure range from 0.50 to 28.1 atm. Within the accuracy of the data, agreement is obtained with the diffusion theory of Enskog and Chapman (Chapman and Cowling, "Mathematical Theory of Non-Uniform Gas" Cambridge Univ. Press, 1939) using the Lennard-Jones model for molecular interaction.

INSTRUMENTS

935

RCA Labs. Div., Radio Corp. of America

ELECTRONIC DEVICES FOR NUCLEAR PHYSICS; QUARTERLY REPORT; JULY 1951–OCTOBER 1951; G. A. Morton, Director. [nd] 18p. (AECU-1783)

Brief statements are given of the progress in designing photomultiplier tubes for scintillation-counting circuits. The operating characteristics of seven multipliers (Type 4646) are tabulated. Photographs and a discussion of the mechanisms of a phenomenon present in photomultipliers called "after-pulsing" are given. The time delay in secondary emission of photomultiplier tubes is discussed. A data sheet for a pulsed light source for use as a source of artificial scintillations of constant amplitude for resolution testing purposes is given. Various pulse-height selector tubes are discussed.

936

Cornell Aeronautical Lab., Inc.

A WIRE RESISTANCE STRAIN GAGE FOR THE MEASUREMENT OF STATIC STRAINS AT TEMPERATURES UP TO 1600°F; by J. E. Carpenter and L. D. Morris. June 1950. 22p. (CAL-33)

937

Los Alamos Scientific Lab.

PRECISION MEASUREMENT OF UNIFORMITY OF MATERIALS BY GAMMA-RAY TRANSMISSION; by Arthur I. Berman and John N. Harris. Nov. 1, 1951. 23p. (LA-1326)

The uniformity of the product of thickness and density (i.e., mass per unit area) of materials of constant mass absorption coefficient is determined by measurements of the variation in γ-ray transmission. The radiation is detected with a scintillation detector and vibrating-reed electrometer. For a given incident intensity, maximum sensitivity is attained when a source is chosen which emits γ rays whose mean free path in the material under investigation equals the thickness. This optimum condition for Co^{60} radiation obtains for thicknesses of 3, 1, and ½ in. of Al, Fe, and U, respectively; using a 1-c source, variations of 0.01% in the uniformity of plates of these thicknesses have been measured. The method may be applied also to the scanning of curved surfaces and extended materials where the source and detector cannot be fixed permanently with respect to each other. For this latter case, the problem of compensating for the effect of source-detector misalignment is considered. (auth)

938

[Ministry of Supply (Great Britain)]

WIND VELOCITY PROFILE IN THE LOWER ATMOSPHERE; PART I. THE VERTICAL WIND GRADIENT APPARATUS; by E. L. Deacon. Feb. 16, 1943. 31p. (PORTON-2474; Reference Item 19(a) Note M-212)

The development of the theory of diffusion in a turbulent atmosphere made it a matter of importance to obtain accurate data on the variation of wind velocity with height up to about 15 m over both short and long grass. The report describes in detail the development of suitable recording anemometers of the necessary high degree of accuracy. The final form of these anemometers employed a photoelectric system since a direct electric-contact system was found to be unsuitable. These photoelectric anemometers have been shown to retain their calibrations after considerable periods of exposure to weather. The results obtained from periods of operation amounting to several weeks over long grass some 60 to 70 cm high are discussed.

939

Radiophysics Lab., Univ. Grounds, Sydney (Australia)

AUTOMATIC COMPUTATION; THE DESIGN OF THE MK. 1 AUTOMATIC COMPUTER; by T. Pearcey. June 1951. 65p. (RPR-119)

A theoretical discussion of the design of an electronic-type automatic computer (Mk. 1) is given with block diagrams of the circuits and layout of the equipment. The report is intended to aid the reader to follow later dissertations on methods of programing and use of the computer. (See following abstract)

940

Radiophysics Lab., Univ. Grounds, Sydney (Australia)

AUTOMATIC COMPUTATION; PART II. PROGRAMMES FOR AN AUTOMATIC COMPUTER; by T. Pearcey. July 1951. 37p. (RPR-120)

The methods of programing and use of the Mk. 1 computer are given. The progressive development of linear programs into repeated programs are discussed. The form of programs designed for elaborate computations are described, and nomenclature and notation for the design of programs for the computation under construction are stated.

941

[Radiation Lab., Univ. of Calif.]

300-KV PULSE TRANSFORMER AND PULSER; by [R. E. Heller]. Nov. 1951. (UCRL-1574)

Photographs and working drawings are presented for a small (approx. $4¼ \times 7 \times 9$ in.) 300-kv pulse transformer having double-conical secondaries each with a corona ring at its greatest diameter. The pulser circuit is shown but no text is included.

942

AN IMPROVED QUENCH CIRCUIT FOR PARALLEL-PLATE COUNTERS. Donald E. Hudson. Rev. Sci. Instruments 22, 850(1951) Nov. (Laboratory and shop notes)

A circuit diagram is given of a quenching circuit for parallel-plate counters. Interesting features of the circuit are the use of the new high-gain high-voltage 3D21A tubes and the employment of a simple gate generator which can be triggered at an arbitrary rate with essentially full pulse duration. The operation of the circuit is described.

943

PULSE CIRCUITS FOR THE MILLIMICROSECOND RANGE. F. H. Wells. J. Brit. Inst. Radio Engrs. 11, 491-503(1951) Nov.

A review is given of the circuit techniques used in measurements on short pulses and the time intervals between pulses in the range 10^{-9} to 10^{-7} sec, with particular reference to nuclear physics measurements. The circuits described have been developed for work with scintillation counters and spark counters and include pulse shaping circuits, pulse generators, amplifiers, scalers, and recording oscilloscopes. Examples of the use of these circuits for high speed coincidence measurements, millimicrosecond time interval measurements, and fast counting are given. (auth)

944

A SENSITIVE DIFFERENTIAL MANOMETER. J. M. Los and J. A. Morrison. Rev. Sci. Instruments 22, 805-9(1951) Nov.

A sensitive differential mercury manometer is described. Mercury surfaces in two arms of the manometer form plates of condensers connected to two nearly identical oscillator circuits. A change in pressure produces a change in the beat frequency of the oscillators which is measured by comparison on an oscilloscope with the output of an audiosignal generator. For $0 < \Delta p < 0.02$ cm an accuracy of 0.1 to 0.2 μ of mercury is obtained. For Δp between 0.02 cm and the maximum measurable with the manometer (approximately 0.25 cm) the accuracy appears to be 0.1% or better. (auth)

945

CAMERA FOR USE WITH WILSON CLOUD CHAMBER. J. B. McQuitty and R. H. Frost. Rev. Sci. Instruments 22, 845-7(1951) Nov. (Laboratory and shop notes)

An automatic camera is described for taking Wilson-cloud-chamber pictures. The design details of the camera are given which show the flexibility of relative lens and film positioning obtained with the special lens mount. Various photographic arrangements are obtained by rotation of the lens mounts, permitting the photography of an object either from mutually perpendicular directions or from directions at small angles to each other and thus permitting stereoscopic viewing without disturbance to the positioning of the camera film. Since the lens axis of rotation is along the long dimension of the 35-mm film used, the camera is especially suitable for photographing vertically elongated regions of a cloud chamber.

ISOTOPE SEPARATION

946

Naval Research Lab.

THE ELECTROLYTIC SEPARATION OF LITHIUM ISOTOPES FROM MOLTEN SALT; by J. I. Hoover and G. E. Holloway. Nov. 2, 1951. 9p. (NRL-3897)

The lithium isotopes have been separated by the electrolysis of molten $LiNO_3$ utilizing regeneration of the salt at the electrode as a reflux mechanism. The ratio of Li^7 to Li^6 was increased from its normal value of 12.7 to 21.22 in about 200 hr of running at low current density. The method is simple and could be adapted to continuous operation.

MASS SPECTROGRAPHY

947

MASS SPECTROMETRIC STUDIES OF MOLECULAR IONS IN THE NOBLE GASES. John A. Hornbeck and J. P. Molnar. Phys. Rev. 84, 621-5(1951) Nov. 15.

Molecular ions of the rare gases (He_2^+, Ne_2^+, A_2^+, Kr_2^+, and Xe_2^+) produced by electron impact at gas pressures from 10^{-4} to 10^{-2} mm Hg have been studied with a small mass spectrometer. The ion intensity increased linearly with electron current and with the square of the gas pressure. The form of the ionization vs. electron energy curves resembles closely curves of excitation probability by electron collision. The appearance potentials of the molecular ions were less than those of the atomic ions by $1.4^{+0.7}_{-0.2}$ volts in He, $0.7^{\pm 0.7}_{-0.3}$ volt in Ne, $0.7^{+0.7}_{-0.2}$ volt in A, $0.7^{+0.7}_{-0.3}$ volt in Kr. These results can be interpreted, we believe, only by assuming that the process of formation of the molecular ions observed in this experiment is, using helium as an example, an excitation by electron impact, $He + e + K.E. \rightarrow He^* + e$, followed by the collision process, $He^* + He \rightarrow He_2^+ + e$, where He^* stands for a helium atom raised to a high-lying excited state. Our results differ from those of Arnot and M'Ewen on He particularly in that they reported the appearance potential low enough to permit metastable atoms to form molecular ions. (auth)

MATHEMATICS

948

Los Alamos Scientific Lab.

CONVEX REGIONS ASSOCIATED IN SUBSPACES; by Andrew Sobczyk and P. C. Hammer. [nd] 12p. (AECU-1785; LADC-1068)

The interior and exterior associated convex regions, of a convex region C in n-dimensional linear space E_n, have previously been defined and studied. In this present paper the existence and convexity of further associated regions are shown; the new regions (with respect to E_{n-k}) are defined for each decomposition of E_n into complementary linear subspaces E_{n-k} and E_k (dimensions indicated by the subscripts). The former regions are the case k = 0 of the new regions.

949

Los Alamos Scientific Lab.

SYMMETRIZATION OF CONVEX BODIES; by P. C. Hammer and Andrew Sobczyk. [nd] 10p. (AECU-1786; LADC-1073)

One generalization of the well known symmetrization due to Steiner is introduced. The generalization consists in first establishing symmetrization of a convex body with respect to a point and then using this definition to define symmetrization with respect to any linear subspace E_k of E_n. When $k = n-1$ the symmetrization coincides with that of Steiner. It is shown that these symmetrical bodies obtained from a convex body C are, in a sense, the limiting bodies as $r \rightarrow \infty$ of certain convex bodies C(r) associated with a convex body C. In general, the problems of change of surface area and of volume under these symmetrizations are not solved here. These problems are perhaps not the most relevant ones for the type of symmetrization discussed. For the planar case, however, the amusing result is obtained that the circumference of a convex body is invariant under point symmetrization. In particular, as constant diameter convex bodies go into circles under point symmetrization, this provides another proof that the circumference of a constant diameter body is the same as that of a circle with the same diameter. (auth)

950

Los Alamos Scientific Lab.

ADDITIVE SET FUNCTIONS AND CONVEX SETS; by P. C. Hammer and Andrew Sobczyk. [nd] 11p. (AECU-1787; LADC-1070)

This paper extends previously introduced conceptions of division of mass distributions by hyperplanes in E_n. The extensions presented in this paper result from considering unbounded sets, from replacing mass distributions by non-negative additive set functions from the introduction of concepts of vanishing at infinity, L-continuity, and from the introduction of slabwise inseparability rather than connectedness conditions. Semispaces are defined as the union of certain sets of relatively open halves of linear manifolds. It is shown that every convex set which does not contain all points in E_n is the intersection set of a class of semispaces. A functional r(x) based on the division of an additive set function by semispaces is shown to be subconvex and to have convex interior sets. Increasing restrictions on additive set functions yields a continuous functional r(x) with level sets which are, in the main, (n−1)-dimensional convex surfaces. (auth)

951
Knolls Atomic Power Lab.
A SIMPLE SEQUENTIAL TEST FOR CALIBRATION PURPOSES; by W. S. Horton. Nov. 21, 1951. 12p. (KAPL-647)

A test is described that can be performed with the numerical results during the course of repetitive calibration in order to estimate the total number of replicates required to obtain the desired degree of precision. The sequential test described is based upon the fact that, to obtain confidence limits of a given absolute value, a certain ratio of t to $\sqrt{n}$ must be attained, where t is "Student's t" and n is the number of determinations.

952
[Oak Ridge National Lab., Y-12 Area]
STABILITY OF DIFFERENCE EQUATION APPROXIMATIONS; by Herman Kahn. Feb. 13, 1951. 7p. (Y-F10-40)

The instabilities introduced in the solution by solving the differential equation $A(\partial f/\partial t) = D(\partial^2 f/\partial r^2) - Bf + S(r,t)$ by means of a reduction to difference equations are discussed. The conditions which limit the stability for particular solutions are given.

953
Oak Ridge National Lab., Y-12 Area
THE CALCULATION OF EIGENVALUES OF DIFFERENTIAL SYSTEMS BY NUMERICAL INTEGRATION; by R. R. Coveyou. Aug. 30, 1951. 11p. (Y-F10-72)

The numerical integration of differential systems is considered, with special emphasis on obtaining precise estimates for the eigenvalues. This problem arises in the numerical integration of the age-diffusion equation. Two parameters are chosen to optimize the estimates of the eigenvalues obtained from the difference equations. Three experimental examples are given to illustrate the reduction of errors in eigenvalues when the corrections (parameters) developed are used. If the corrections are not used, the error in the eigenvalues is proportional to the square of the lattice spacing, while with the correction it is proportional to the fourth power of the lattice spacing. The effectiveness of the correction increases as the lattice spacing is decreased.

MEASURING INSTRUMENTS AND TECHNIQUES

954
Saint Louis Univ.
COMPLETE SCIENTIFIC REPORT (FINAL REPORT); FOR PERIOD 1 OCTOBER 1950 TO 30 SEPTEMBER 1951; by A. V. Bushkovitch, Robert Doerner, Edward F. Sturcken, Robert B. Heller, James Monahan, and A. H. Weber. Nov. 1, 1951. 22p. (AECU-1756)

The β spectrum of P^{32} has been investigated with a thin-magnetic-lens spectrometer. The momentum distribution is shown; its shape confirms the low-energy complexity which apparently is due to the presence of a weak P^{33} β. A magnetic-lens-spectrometer analysis of S^{35} was reported in Phys. Rev. 83, 848(1951), and a reprint copy of the letter is included in the report. A 180° constant-magnetic-field spectrometer has been completed and tested for performance. Photographs and cross-section diagrams of the spectrometer are presented, and photographic records of the $Eu^{152-154}$ and RaDEF electron spectra also are shown. The possibility of photographic measurement of continuous β spectra in the 180° spectrometer is discussed.

955
Los Alamos Scientific Lab.
SiO FILMS (abstract); by G. A. Sawyer, W. R. Arnold, J. A. Phillips, E. J. Stovall, Jr., and J. L. Tuck. [nd] 1p. (AECU-1789; LADC-1077)

Thin self-supporting films of silicon monoxide have been prepared by evaporation onto organic (Zapon) film backings which are subsequently removed by ion bombardment or solvents. The films are ±300 atoms (8 $\mu g/cm^2$) thick and will withstand 3 mm gas pressure differential while transmitting several μa of 50-kev deuterons at 5-kev energy loss. The measured rms multiple scattering angle in such films at this energy is 7°. Thus beams of low-energy charged particles can be introduced into a gas from vacuum with good geometry, small energy loss, and accurately measured intensity. The films are uniform but, at these small thicknesses, the statistics of the energy-loss process gives appreciable straggling. We observe a gaussian distribution of half width 500 ev about the mean 5-kev energy loss. Al films seem to be equally strong, but have proved unsuitable for precise measurements on account of a growth in stopping power under bombardment, by about 10%/hr, presumably by chemical reaction with residual gas. (Entire report)

956
Atomic Energy Research Establishment, Harwell, Berks (England)
T.P.A. Mk. II IONISATION CHAMBER; by J. Sharpe and F. Wade. Oct. 24, 1951. 7p. (AERE-EL/R-806)

By using the maximum number of standard TPA ionization-chamber components and suitably modifying the design, a chamber, TPA Mk. II, with a re-entrant thimble can be made without introducing complicated techniques. This chamber can be filled with gas pressures up to 20 atm. It is more efficient than the standard TPA for the measurement of small sources by a factor of about 2. It has an inherently stable geometry.

957
Atomic Energy Research Establishment, Harwell, Berks (England)
T.P.A. IONIZATION CHAMBER Mk. IV; by F. Wade. Oct. 19, 1951. 8p. (AERE-EL/R-807)

The TPA Mk. IV ionization chamber designed to use standard components used in the manufacture of the standard TPA ionization chambers is described. The β-active material to be monitored is inserted into an aluminum tube which passes through the center of the chamber. The TPA Mk. IV ionization chamber was designed primarily for use in a neutron-density plotter but subsequent experience has shown that it can be used to measure rapidly and accurately the high activity of substandard sources prepared by the AERE Isotope Division.

958
Argonne National Lab.
AN ANNULAR IONIZATION CHAMBER; by Paul J. Persiani. Oct. 1951. 20p. (ANL-4702)

An annular type ionization chamber was designed for the continuous monitoring of γ radiation from radioactive liquids and gases in a flowing system. The ionization chamber consists of two concentric cylindrical tubes: an outer cylinder (tank) having an OD of 12¾ in. and an over-all length of 28¾ in.; and an inner tube, 2¼ in. OD, with ⅛ in. wall thickness, and an over-all length of 38 in. Flanges are provided at each end to make the necessary connections to conduits. The radioactive fluid is passed through the inner cylinder. The outer chamber contains c.p. argon (99.9%). The signal electrode is placed ⅛ in. from the inner tube, and the high voltage electrode is positioned ¼ in. from the tank wall. The signal electrode and chamber walls are kept at ground potential. The arrangement yields a sensitive volume of ~38 liters. (auth)

959
Los Alamos Scientific Lab.
INVESTIGATION OF ALPHA CHAMBER DESIGN FOR

LARGE SAMPLES; by John H. Larkins. Nov. 1951. 19p. (LA-1310)

Investigation of the counting characteristics of two types of internal-sample methane-flow proportional alpha chambers was made in evaluating chambers capable of accommodating sample plates of at least 2½ in. diam. Simplicity of construction, reliability of operation, and ease of maintenance were required. Design and performance data are given for the two chambers and results are discussed.

960

Mound Lab.

REPORT FOR GENERAL RESEARCH; APRIL 16, 1951, TO JULY 30, 1951 (Supporting Research Volume); M. M. Haring, Director. Sept. 30, 1951. 57p. (MLM-603)

No appreciable difference has been found between beta rays and photon-induced secondary electrons by differential counting using a Nuclear Measurements Corporation PC-2 counter with either pure methane or a 90% argon—10% methane mixture as the counter gas. Because of differences in specific activity, particle energy, solid content, or backing material, individual samples submitted for routine counting have been found which had counting-voltage plateaus which differed from the voltage plateau normally established by counting a RaD-E-F equilibrium standard. An investigation was initiated to study methods of preparing thin, plastic films for use as absorbers in the study of low-energy alpha and beta particles. Films 1 in. in diameter and having weights in the order of 25 $\mu g/cm^2$ have been made by placing a drop of an ethylene dichloride solution of Formvar E on the surface of cold water, allowing the solvent to evaporate, and then removing the film by raising a wire ring under it. The modern theory of noise has been investigated with the goal of developing methods for treating data which involve noise effects, evaluating methods of noise reduction, and accurate noise-level evaluation. With this theory of noise, an equation was developed which expresses the response of a calorimeter to internal and external thermal noises as a function of the damping constant of the calorimeter and the area under the autocorrelation curve of the noise to which the calorimeter is subjected. It appears that the factors which determine the lower limit of detectability of our calorimeters are gross changes in the environment and stirring noise. It has been shown that under certain conditions the solution of second-order differential equations with given boundary conditions represents very closely the experimental cooling curves of calorimeters loaded with additional heat capacity. These theoretical considerations give added confidence to heat capacities measured by determining the area under a cooling curve. They also make possible calculation of certain properties of a calorimeter from the constants of the materials and the physical dimensions before it is constructed. A method for measuring the heat conductivities of poor thermal conductors has been suggested.

961

Johns Hopkins Univ.

SCINTILLATIONS IN THE DIPHENYLPOLYENES AND RELATED COMPOUNDS; by W. S. Koski and C. O. Thomas. July 1951. 16p. (NYO-954)

This article appeared in J. Chem. Phys. 19, 1286-90(1951) Oct. and was abstracted in Nuclear Science Abstracts as NSA 5-7205.

962

Radiation Lab., Univ. of Calif.

SUMMARY OF THE RESEARCH PROGRESS MEETING OF SEPTEMBER 20, 1951; by Sergey Shewchuck. Oct. 16, 1951. 9p. (UCRL-1504)

Commercial manufacture of a ten-channel cathode-ray differential pulse-analyzer tube is reported. The pulse analyzer is described and photographs are included. The procedure for producing stilbene crystals approximately 8 in. in diameter is reported. A 4- by 8-ft by 7-in. continuous cloud chamber with a sensitive region of about 3 in., to be used in an attempt to photograph the core of a large cosmic-ray shower, is described and preliminary data are presented graphically.

963

Radiation Lab., Univ. of Calif.

SUMMARY OF THE RESEARCH PROGRESS MEETING OF OCTOBER 18, 1951; by S. Shewchuck. Nov. 29, 1951. 6p. (UCRL-1582)

This report is comprised of abstracts of four separate articles by Dr. Ryokichi Sagane, namely, "Computation of Photonuclear Resonance Curves from Relative Activity Curves Monitored by Induced Radioactivity," Phys. Rev. 84, 586-7(1951) Nov. 1; "Unusual Broad Resonances in $C^{12}(\gamma,n)C^{11}$ and $O^{16}(\gamma,n)O^{15}$," Phys. Rev. 84, 587-8(1951) Nov. 1; "Photodisintegration Processes with Abnormally Large High Energy Cross Sections," to be published; and "Relative Probabilities of Diverse Photonuclear Reactions from Zn^{64} and Fe^{54}," to be published.

964

THE MEASUREMENT OF BETA RADIATION DOSAGE WITH PHOTOGRAPHIC EMULSIONS. Robert Augur Dudley. Dissertation, Mass. Inst. of Tech., 1951. 274p.

Following a detailed discussion on the interaction of β rays with matter and a survey of β-ray dosimetry techniques and photographic principles, the author reports experiments on the response of numerous commercial films to monokinetic electrons, taken from a β-ray spectrometer, of energy 0.03 to 1.8 Mev. The dependence on electron energy of the shape of density curves and the absolute sensitivity for different angles of incidence are among the basic film properties studies. The response of the same films to continuous-spectrum β rays of graded maximum energies also has been studied, yielding fundamental data on the effect of absorbers on exposure efficiency. The results obtained have been applied to photographic determination of the surface dosage rate of β-ray applicators and of the dosage rate of Ca^{45} deposits in dog bone. Other applications are suggested. 124 references.

965

USE OF COLLODION COVERINGS TO PREVENT CRUMBLING AND DUSTING OF RADIOACTIVE PLANT PELLETS. W. A. Seay. Agronomy J. 43, 570-1(1951) Nov.

Modification of a rapid method for determining radioactivity in plant tissues is described. The plant material is ground and pressed into a cylindrical briquet which is dipped in collodion solution thus preventing scattering of the sample and contamination of the counting equipment.

966

RESPONSE OF SOME SCINTILLATION CRYSTALS TO CHARGED PARTICLES. C. J. Taylor, W. K. Jentschke, M. E. Remley, F. S. Eby, and P. G. Kruger. Phys. Rev. 84, 1034-43(1951) Dec. 1.

The dependence of the response of anthracene, stilbene, and sodium iodide crystals in a scintillation detector on the type and energy of charged particles incident on the crystal has been investigated. Electrons with energies from 500 ev to 624 kev, deuterons and molecular hydrogen ions with energies of 1 to 11 Mev, protons of 1 to 5 Mev, and α particles of 4 to 21 Mev were employed. With the exception of protons and deuterons in sodium iodide, which gave a linear response over the entire energy region investigated,

plots of pulse height vs. energy for heavy particles gave a nonlinear relation for low energies tending toward linearity with increasing particle energy. Electrons in anthracene and stilbene show a nonlinear response below 100 kev, while the sodium iodide curve is linear above 1000 ev. The response of anthracene, whose behavior may be typical of organic crystals, has been compared for different ionizing radiations by considering the variation of the specific energy loss. Both electrons and heavy particles seem to show regions of linear response which start at quite different values of dE/dx. As the specific energy loss increases the response becomes nonlinear, with the ultimate saturation of the specific fluorescence for large values of dE/dx. (auth)

967

THE EFFECT OF INHOMOGENEITIES ON THE ELECTRICAL PROPERTIES OF DIAMOND. A. J. Ahearn. Phys. Rev. 84, 798-802(1951) Nov. 15.

To account for the nonuniformities in the electrical properties of diamond, particularly those observed in bombardment conduction, the proposal is made that the lattice imperfections are not distributed homogeneously in the physical crystal, and that the resulting fluctuations in the height of the energy bands relative to the Fermi level might produce interspersed "pools of mobile charge" separated by barriers within the diamond. These pools and barriers should lead to dielectric losses at high frequencies. A single conducting channel, in series with a barrier, could be represented by a series resistance R_s and capacity C_s or by the equivalent parallel resistance R_p and capacity C_p.

With some, but not all, diamonds measurable dielectric losses at 70 mc/sec were observed. R_p varied from 5×10^6 ohms, the limit of measurement, to 4×10^5 ohms. Furthermore, the proposed model suggests that, in some cases, these barriers might be sufficiently lowered to establish a d-c conducting channel all the way through a crystal. With a few of the lossy diamonds precisely this phenomenon of "high conduction" has been observed, in which a resistance of the order of a megohm is obtained with a d-c voltage applied. This current appears abruptly in time but it lags behind the application of the voltage. This lag is influenced by irradiation with light or alpha particles or by previous treatment.

968

HOLLOW CYLINDER METHOD OF MEASUREMENT OF P^{32} IN PLANTS. A. M. Kristjanson, H. G. Dion, and J. W. T. Spinks. Can. J. Technol. 29, 496-501(1951) Nov.

By compressing plant material containing radioactive phosphorus into the form of a hollow cylinder and placing around a thin-wall Geiger tube, a direct determination of P^{32} can be made. A standard sample, made by mixing a definite quantity of the radioactive fertilizer with a definite quantity of inactive plant material of the same kind as that being analyzed, is the basis for the determination of fertilizer phosphorus uptake. For the same sample, the counting rate of a hollow cylinder of plant material is approximately 10 times that of a briquet. (auth)

969

DEVELOPMENT OF LARGE CYLINDRICAL SPARK COUNTERS. Donald E. Hudson. Rev. Sci. Instruments 22, 849-50(1951) Nov. (Laboratory and shop note)

The construction of a large spark counter of cylindrical geometry designed for fast timing in typical cosmic-ray applications is described. A spark counter consists of two parallel metal electrodes providing a strong electric field in a narrow counting gap filled with a mixture of gases. At a certain threshold voltage the field becomes strong enough to maintain a streamer-spark initiated by an ionizing event; at this point the device becomes a counter. Ordinarily the counter is operated at a voltage much higher than the threshold and the difference is called the overvoltage. Usually each spark gives rise to delayed electrons that can start another spark. To prevent this "aftereffect," a quenching circuit is employed which removes the operating voltage for a period of time (T_Q) following each count. Typical values of T_Q range from 10^{-3} to 1 sec. A block diagram of the spark counter and graphs of counting rate vs. quenching time and counting rate vs. overvoltage are given.

970

SELF-QUENCHING COUNTERS CONTAINING SMALL AMOUNTS OF POLYATOMIC CONSTITUENT. A. D. Krumbein. Rev. Sci. Instruments 22, 821-7(1951) Nov.

The least amount of quenching constituent, Q_m, required to produce self-quenching action in counters filled with rare gas–polyatomic gas or vapor mixtures, was measured as a function of cathode radius and total pressure for methane, butane, and ethyl acetate in helium, neon, and argon. It was found that the variation of Q_m with cathode radius and with total pressure was in accord with the Korff-Present theory of quenching action for counters of this type. From these minimum amounts necessary to quench, the average least number of collisions, M_{12}, required to affect electron transfer between the rare gas ions and polyatomic molecules, was calculated for each of the nine mixtures used. M_{12} was found to vary from about 1 collision per transfer for the ethyl acetate-neon mixture to more than 1000 collisions per transfer for the methane-helium mixture. The order of decreasing values of M_{12} in each of the three rare gases used was methane, butane, and ethyl acetate, while the order of decreasing values of M_{12} for any one polyatomic substance in the three rare gases was helium, argon, and neon. An attempt is made to explain these results using the theory for exchange of charge between atomic ions and molecules formulated by Kallmann and Rosen. (auth)

971

THE USE OF FILM IN X-RAY DIFFRACTION STUDIES. M. H. VanHorn. Rev. Sci. Instruments 22, 809-11(1951) Nov.

Because of the weakness of diffracted beams, it is necessary to work in the low gradient "toe" portion of the characteristic (D-log E) curve. The curve shape in this region is the same for all types of x-ray film commonly used, even when development is greatly prolonged. The shape of the entire characteristic curve is insensitive to radiation quality, but the relative speeds of different films change considerably in the range of wavelengths of interest to diffractionists. For photographic photometry, the linear density-exposure range can be extended by proper selection of the processing conditions. (auth)

972

SUPPRESSION OF SPURIOUS IONS IN THE MASS SPECTROMETER. David C. Hess, George Wetherill, and Mark G. Inghram. Rev. Sci. Instruments 22, 838-9(1951) Nov. (Laboratory and shop note)

A method is described for suppressing the spurious ions or background, thereby increasing the usable sensitivity of a mass spectrometer. To suppress the spurious ions a suppressor grid was inserted between the collimating slit and the filament guard of the mass spectrometer. A voltage of +300 and −300 is applied to the suppressor grid; the suppression ratio shows whether the ions are due to surface ionization or to a tertiary process.

MESONS

973

Rochester Univ.

ELASTIC PHOTO-PRODUCTION OF π^0 MESONS IN DEUTERIUM; by N. C. Francis and R. E. Marshak. Dec. 5, 1951. 7p. (NYO-3037)

The process of elastic photoproduction of π^0 mesons in deuterium ($\gamma + d \rightarrow d + \pi^0$) is considered, the anomalous magnetic moments of both proton and neutron being treated phenomenologically. The "spin" and the "no-spin" contributions to the elastic production cross section were calculated according to weak coupling pseudoscalar (pseudovector) theory; the proton, neutron, and deuteron differential cross sections are plotted for an incident photon of 300 Mev, assuming that the π^0 coupling constants to proton (g_p) and neutron (g_n) are equal and of opposite sign (symmetrical theory) for the deuteron. The cross section for the deuteron is much smaller if it is assumed $g_p = g_n$. In order to provide better agreement of the proton cross section with experiment, the odd part of the PS(PV) operator was suppressed, and the differential cross sections were again calculated and plotted for $g_p = -g_n$. The striking difference between the neutral and symmetrical deuteron persists, and it should therefore be possible to determine the relative sign of g_p and g_n from a measurement of the cross section for elastic photoproduction of π^0 mesons in deuterium.

974

Radiation Lab., Univ. of Calif.

MEASUREMENT OF THE PRODUCTION CROSS-SECTION OF NEGATIVE MESONS IN CARBON BY 341-MEV PROTONS (abstract); by Walter F. Dudziak. [Dec. 4, 1951]. 1p. (UCRL-1595)

The report comprises an abstract of a paper for the New York meeting of the American Physical Society, Jan. 31, 1952, and is reproduced here in its entirety.

Meson production cross sections from carbon in the forward direction to a 341-Mev incident proton beam have been measured. The produced charged mesons were magnetically separated and their number was detected in Ilford C-2, (200 μ) emulsions. The areas were scanned under 570 diameters magnification. The π^- spectrum is based on more than 450 observed star-forming π^- mesons. A comparison of the π^+ and π^- data shows surprising results which are in complete disagreement with those expected from the relation $\frac{\sigma^+}{\sigma^-} = \frac{A+Z}{A-Z}$ which results from the assumption that production matrices in p-n and p-p collisions are the same (E. M. Henley, UCRL-1467, Sept. 1951). The peaks of the π^- and π^+ spectra occur at widely separated meson energies. The σ^- peak occurs at $T_\pi < 25$ Mev while the σ^+ peak occurs at $T_\pi > 70$ Mev. The $\frac{\sigma^+}{\sigma^-}$ ratio of the peaks is approximately 15/1. Within experimental error the integral of the π^- spectrum over energies is the same as obtained at 90° to the proton beam (Richman and Wilcox, Phys. Rev. 78, 496(1950)). This is not true for the σ^+ integral. The marked decrease of σ^- with increasing meson energy might be explained by the effect of the exclusion principle. The large increase of π^+ production may be the result of the resonance reaction (this idea has also been advanced by C. Richman) which accompanies deuteron formation.

975

Radiation Lab., Univ. of Calif.

PHOTO-PRODUCTION OF NEUTRAL MESONS FROM DEUTERIUM; by W. Heckrotte, L. R. Henrich, and J. V. Lepore. Dec. 13, 1951. 5p. (UCRL-1611)

The cross section for neutral-meson production was calculated when a deuteron particle was formed in the final state. The pseudoscalar meson theory with pseudovector coupling was assumed, and the process treated according to the perturbation theory. It was found that the principal contribution to the cross section is proportional to the square of the interaction energy.

976

EXPERIMENTAL SEARCH FOR THE BETA-DECAY OF THE π^+ MESON. Helen L. Friedman and James Rainwater. Phys. Rev. 84, 684-90(1951) Nov. 15.

The possibility that nuclear β decay is associated with the β decay of the meson, formed during an intermediate step, has long been of interest in the development of meson theories. To explain nuclear β decay, the β-decay rate for the π meson should be comparable to its μ-decay rate. The present investigation is an attempt to detect other than $\pi-\mu$ events for π^+ mesons which stop in G-5 400 and 600 micron emulsions. The result is one or zero $\pi-e$ event compared to 1419 $\pi-\mu$ events for mesons satisfying certain selection criteria. A collimating exposure chamber was used in the fringing magnetic field inside the vacuum chamber of the Columbia 164-in. cyclotron to provide energy and direction selection of mesons at the photographic plate. The expected total energy spread for any point x along the plate was calculated to be about 1 Mev. Only mesons were considered which entered the top surface of the emulsion, ended in the emulsion, and had directions and ranges within intervals including about 94% of the π mesons. This procedure assured consideration of essentially all π mesons but discriminated against μ mesons produced by decays in flight. (auth)

977

DISCUSSION OF THE PRINCIPAL PROPERTIES OF MESONS. P. Benoist-Gueutal and J. Ratier. J. phys. radium 12, 873-6(1951) Nov. (Review; in French)

Origin, disintegration, absorption, and mass of π, μ, neutral, and heavy mesons are discussed briefly. 43 references.

978

ON THE SCATTERING OF MESONS IN A 2-CM LEAD PLATE. A. B. Sahiar. Proc. Indian Acad. Sci. 34, 201-13 (1951) Sept.

Photographs of more than 1000 particles traversing a 2-cm lead block inside a Wilson cloud chamber were taken at sea level (Bombay). Coulomb and nuclear scatterings of particles capable of going through 5, 15, 25, and 35 cm of lead were studied. The experimental scattering distributions have been compared and found to be in fairly good agreement with the theoretical distributions calculated by assuming Willaim's scattering distributions and Wilson's energy spectrum measurements at London. A lower limit of the order of 2 to 3×10^{-28} cm^2 per nucleon for the nuclear scattering cross section of mesons has been indicated. This value is in fairly good agreement with the values obtained by most of the experimental workers. The number of large-angle scatterings observed is not sufficiently large for study of the variation of the nuclear scattering cross section with energy.

METEOROLOGY

979

Colorado Agriculture and Medical Coll.

ATMOSPHERIC DIFFUSION FROM A POINT SOURCE; by C. S. Yih. Aug. 1951. 11p. (NP-3525; Report No. 4; U-19167)

The differential equation of diffusion when the wind velocity and the vertical and lateral diffusivities are power functions of height is given. Exact solution of this equation for the case of a point source is presented. In the systematic search for this solution, dimensional analysis has been utilized to the optimum advantage.

NEUTRONS

980

Los Alamos Scientific Lab.

SCATTERING OF FAST NEUTRONS(abstract); by E. T. Jurney and C. W. Zabel. [nd] 1p. (AECU-1788; LADC-1074)

The scattering of fast neutrons by Al, Fe, Ni, Cr, Cu, Ta, Pb, and Bi was investigated by placing samples in the collimated fast-neutron beam emerging from the plutonium fast reactor (Rev. Sci. Instruments 18, 688 (1947)). Small fission ionization chambers containing Np^{237} and U^{238}, respectively, served as neutron detectors. The angular distribution of the scattered neutrons was determined by moving these detectors around the samples. With the same detectors total cross sections were measured in simple transmission experiments. Scattered neutrons detected by the threshold fission counters will be called elastically scattered. If the integral over-all angles of the differential elastic scattering cross section is subtracted from the total cross section, an inelastic collision cross section is obtained. Under the assumption that the inelastic scattering is isotropic, transport cross sections were calculated. For all the elements investigated the elastic cross section shows a strong forward maximum; for some elements an additional small maximum occurs near 100°. (Entire report)

NUCLEAR PHYSICS

981

VIBRATION-ROTATION SPECTRA OF ATOMIC NUCLEI. V. E. Golant. Zhur. Eksptl'. i Teoret. Fiz. 21, No. 7, 780-7(1951) July. (In Russian)

The γ radiation from heavy nuclei with low excitation energies is investigated on the basis of the drop model. The probability of γ transitions combined with simultaneous changes in vibration and rotation states of the nucleus is calculated. Interaction of the nuclear vibration and rotation is negligible.

982

SHELL STRUCTURE OF THE ATOMIC NUCLEUS. II. Erich Bagge. Naturwissenschaften 38, No. 20, 473-5(1951) Oct. (Note; in German)

The two "magic number" series N (2, 6, 14, 28, 50, 82, 126) and γ (8, 20, 40, 70, 112) are related according to shell-structure terms. Various features of nuclear structure such as the high quadrupole moments in the region of 70 nucleons and the location of the "islands of nuclear isomerism" are shown to arise naturally from the shell model discussed.

983

ON A POSSIBLE MECHANISM OF NUCLEAR γ RADIATION WITH PARTICIPATION OF A NEUTRAL MESON. I. S. Shapiro. Zhur. Eksptl'. i Teoret. Fiz. 21, No. 6, 731-6(1951) June. (In Russian)

A theory of nuclear γ radiation as a process of virtual emission of a neutral meson by the excited nucleus and the subsequent dissociation of the meson is developed. The probability of this process for electric quadrupole transition is calculated.

NUCLEAR PROPERTIES

984

Columbia Univ.

SLOW NEUTRON TRANSMISSION OF THORIUM; by W. W. Havens, Jr. and L. J. Rainwater. Apr. 17, 1951. Decl. Dec. 21, 1951. 4p. (AECD-3288; CUD-90; DR-1642)

Three graphs are presented of the slow neutron transmission of Th in and just above the thermal-energy region. The best fit for the 1/v absorption curve is given by $\sigma = 11.90 + 1.58E^{-\frac{1}{2}}$. In the high-energy region there are sharp minima in transmission at 23 and 84 ev, and a broad minimum in the vicinity of 300 ev. The dip at 23 ev is probably caused by a single level. This dip has been analyzed roughly by the area method which gives a $\sigma_0\Gamma^2 \sim 35$ barns $(ev)^2$. The dips at 84 and 300 ev have not been analyzed, as these are probably caused by more than one level.

985

Wisconsin Univ.

A COMPARISON OF SEVERAL NUCLEAR ABSOLUTE VOLTAGE DETERMINATIONS; by William J. Sturm and Virgil Johnson. [nd] 23p. (AECU-1747)

This material appeared in Phys. Rev. 83, 542-7(1951) and was abstracted in Nuclear Science Abstracts as NSA 5-6449.

986

Wisconsin Univ.

CLASSIFICATION OF ENERGY LEVELS IN Al^{25}; by Louis J. Koester, Jr. [nd] 44p. (AECU-1759)

An abstract of this report was indexed as report AECU-1618 and appears in its entirety in Nuclear Science Abstracts as NSA 5-6398.

987

Wisconsin Univ.

ENERGY LEVELS OF C^{11} AND C^{12} FROM PHOTOGRAPHIC PLATE OBSERVATION OF NEUTRON SPECTRA; by Virgil R. Johnson. [nd] 26p. (AECU-1760)

The energies of neutrons from $B^{10}(d,n)C^{11}$ and $B^{11}(d,n)C^{12}$ reactions have been measured by use of photographic emulsions and enriched B^{10} targets. Neutron groups corresponding to levels in C^{11} at 1.85, 4.23, 4.77, 6.40, 6.77, 7.39, 8.08, 8.39, 8.62, and possibly 8.97 and 9.13, have been observed. Most of these levels in C^{11} show good correspondence to those previously reported for the mirror nucleus B^{11}. This correspondence supports the assumed equality of n-n and p-p forces. Neutrons from normal boron targets were observed, corresponding to levels in C^{12} at 4.4, 9.6, 10.8, 11.1, 11.74, 12.76, 15.09, 16.07 Mev excitation. There was also some indication of additional levels at 13.21, 13.36, 14.16, and 15.52 Mev excitation. (auth)

988

QUADRUPOLE RESONANCE FREQUENCIES OF CRYSTALLINE BROMINE. H. G. Dehmelt. Z. Physik 130, No. 4, 480-2(1951). (In German)

Quadrupole moments Q of $+0.30 \times 10^{-24}$ and $+0.25 \times 10^{-24}$ cm^2 for Br^{79} and Br^{81}, respectively, have been determined from quadrupole resonance measurements of polycrystalline Br_2 at 83°K.

989

NUCLEAR BINDING ENERGIES FOR ISOTOPES WITH MASSES BETWEEN 50 AND 60. A. H. Wapstra. Phys. Rev. 84, 837-8(1951) Nov. 15.

The differences in binding energies of Fe^{54}-Cr^{52}, Fe^{56}-Fe^{54}, Ni^{58}-Fe^{56}, and Ni^{60}-Ni^{58} are computed from reaction-energy data and also from the mass-spectrographic measurements of Duckworth et al. (Phys. Rev. 78, 179, 386, 479(1950); 79, 402(1950)) together with binding energies of C, O, and Si isotopes. Binding energies of the isotopes involved are then evaluated. A note added in proof gives still more recent adjustments, with the following binding energies (in Mev): Cr^{52}, 456.25; Fe^{54}, 471.85; Fe^{56}, 492.25; Ni^{58}, 506.55; and Ni^{60}, 527.15, with an estimated mean error of 0.3 Mev.

990

DIRECTIONAL CORRELATION OF SUCCESSIVE NUCLEAR RADIATIONS. Giulio Racah. Phys. Rev. 84, 910-12(1951) Dec. 1.

Using the algebra of tensor operators a closed expression is obtained for the most general case of angular correla-

tion. The structure of the correlation function is explained by means of semiclassical considerations. (auth)

991

ATOMIC MASSES IN THE REGION ABOUT MASS 40. T. L. Collins, Alfred O. Nier, and Walter H. Johnson, Jr. Phys. Rev. 84, 717-21(1951) Nov. 15.

The double-focusing mass spectrometer developed for the precise determination of atomic masses has been improved. A redetermination of the mass doublets $4C^{12}-S^{32}O^{16}$, $2O^{16}-S^{32}$, and $C^{12}H_4-O^{16}$ leads to the following masses: $H^1 = 1.008146 \pm 3$, $C^{12} = 12.003842 \pm 4$, and $S^{32} = 31.982236 \pm 7$. The relation of these results to those of other investigators is discussed. Mass doublet comparisons between hydrocarbon fragments and S^{32}, S^{33}, S^{34}, Cl^{35}, Cl^{37}, A^{36}, A^{38}, K^{39}, K^{41}, Ca^{42}, Ca^{43}, Ca^{44}, Ca^{48}, and Sc^{45} have been made and mass values for these nuclides tabulated assuming both mass spectroscopic and nuclear reaction determined mass values for H^1 and C^{12}. The packing fraction curve in the mass 40 region follows the general trends predicted by a formula such as that of Bohr and Wheeler, except at masses 40 and 48 where there appear to be marked discrepancies. (auth)

992

MASSES OF LIGHT NUCLEI FROM NUCLEAR DISINTEGRATION ENERGIES. H. A. Wilson, Phys. Rev. 84, 836(1951) Nov. 15.

In a recent paper Li, Whaling, Fowler, and Lauritsen (Phys. Rev. 83, 512(1951)) stated that now for the first time it is possible to calculate the masses of light nuclei in terms of O^{16} from nuclear reaction energies without using mass spectroscopic results. The author points out that he published similar calculations in 1937 ("Modern Physics," Glasgow, Blackie & Son, Ltd.) 1937, 2d ed., that has neutron and hydrogen mass values are very close to the new values. The other masses differ slightly.

993

THE ISOTOPE EFFECT IN SUPERCONDUCTIVITY. I. MERCURY. C. A. Reynolds, B. Serin, and L. B. Nesbitt. Phys. Rev. 84, 691-4(1951) Nov. 15.

The critical magnetic fields of various isotopic mixtures of mercury have been measured as a function of temperature. The critical magnetic field at any temperature is found to decrease with increasing average mass, and the critical temperature also decreases with increasing mass. The relationship $M^{1/2}T_c = \text{const}$, connecting the critical temperature T_c and the average mass number M, is established. Conclusions are drawn concerning the specific heats of the normal and superconducting states of the isotopes. (auth)

994

ON THE MAGNETIC MOMENT OF $Te^{123,125}$ AND Si^{29}. S. S. Dharmatti and H. E. Weaver, Jr. Phys. Rev. 84, 843-4 (1951) Nov. 15.

Nuclear induction signals of $Te^{123,125}$ were detected in a solution of TeO_2 in HCl and chemically pure Te metal in aqua regia. Signals of Te^{125} with a line width of about $\frac{1}{10}$ gauss (probably in part determined by the magnetic-field inhomogeneity) were observed in both solutions without the addition of paramagnetic ions. The resonant frequencies were compared with that of Na^{23}, and the magnetic moments were determined as follows: $\mu(Te^{125}) = -0.88235 \pm 0.00004$; $\mu(Te^{123}) = -0.73188 \pm 0.00004$. Signals of Si^{29} were found in powdered Si metal. Signals were also found in a solution of SiO_2 in NaOH and $K_3Fe(CN)_6$ and in different types of glasses. By assuming the spin of Si^{29} to be $\frac{1}{2}$, the magnetic moment was determined to be $\mu(Si^{29}) = -0.55492 \pm 0.00004$.

995

NUCLEAR RESONANCE ABSORPTION APPLIED TO PRECISE MEASUREMENTS OF NUCLEAR MAGNETIC MOMENTS AND THE ESTABLISHMENT OF AN ABSOLUTE ENERGY SCALE IN β SPECTROSCOPY. Gunnar Lindström. Arkiv Fysik 4, No. 1, 1-78(1951).

An apparatus for precision measurement of nuclear magnetic moments is described, and a new method of comparing two magnetic resonance signals on an oscillograph is discussed. A magnetic-field stabilizer using a proton sample has been constructed. The following frequency ratios have been determined:

$\nu_D/\nu_H = 0.15350668 \pm 0.00000012$ for H_2O and D_2O

$\nu_{Li^7}/\nu_H = 0.3886341 \pm 0.0000010$ for H_2O and $LiNO_3$

$\nu_{B^{11}}/\nu_H = 0.3208381 \pm 0.0000008$ for H_2O and $\begin{cases} Na_2B_2O_4 \\ K_2B_2O_4 \end{cases}$

$\nu_{F^{19}}/\nu_H = 0.9409330 \pm 0.0000030$ for H_2O and $CFCl_3$

$\nu_{Na^{23}}/\nu_H = 0.2645182 \pm 0.0000007$ for H_2O and $\begin{cases} Na_2B_2O_4 \\ NB_2 \end{cases}$

$\nu_{Al^{27}}/\nu_H = 0.2605694 \pm 0.0000010$ for H_2O and $AlCl_3$

The diamagnetic correction and the values in nuclear magnetons are discussed.

A chemical dependence of the order of $(4.2 \pm 1.5)\,10^{-6}$ for the proton resonance frequencies in H_2O and paraffin oil has been found. Some fluorine compounds have also been investigated giving a chemical dependence of up to $(171.8\ 2.0)\,10^{-6}$. The $\nu_{Na^{23}}/\nu_H$ ratio has been combined with some values given by other workers, giving the ratio between the g values for the electron and the path $g_s/g_L = 2(1 + 0.00114 \pm 0.00006)$. A small β spectrograph for absolute determinations has been constructed. The line shape is discussed. The $(H\rho)$-values for the F, I and L lines of Th(BCC'') has been determined, giving the following numerical values: 1388.56 ± 0.15, 1754.01 ± 0.20, and 2607.17 ± 0.30 gauss-cm, respectively. It has been shown that the β^- and β^+ masses are equal within an accuracy of 0.01%. The gyromagnetic ratio γ_p has been determined to $(2.67525 \pm 0.00020)\ 10^4$/sec/gauss.

996

ON THE QUADRUPOLE MOMENT OF THE GOLD NUCLEUS. Winrich von Siemens. Naturwissenschaften 38, No. 19, 455(1951) Oct. (Note; in German)

A high-resolution spectroscopic study of the $^2D_{3/2}$ terms of the Au I lines 5065, 5837, and 6287 A has shown the quadrupole moment Q of the Au^{197} nucleus to be $\sim 0.5 \times 10^{-24}$ cm^2. The magnetic dipole moment μ has been calculated from previous observations to be 0.16 nuclear magnetons. As a consequence of the relatively large electric quadrupole moment and the extremely small magnetic hfs splitting, the interval rule is so strongly distorted in the $^2D_{3/2}$ terms that the F = 2 and F = 3 terms are interchanged.

997

AN EXPERIMENT ON NUCLEAR ALIGNMENT: THE ANISOTROPY OF γ-RADIATION FROM ORIENTED COBALT-60 NUCLEI. J. M. Daniels, M. A. Grace, and F. N. H. Robinson. Nature 168, 780-1(1951) Nov. 3.

Crystals of Co^{60} were mounted in a demagnetization cryostat with parallel crystallographic orientation and with 2 of the principal axes of susceptibility in a horizontal plane; electron alignment was achieved through interaction of the electrons with the crystalline field. The substance used was a mixed Tutton salt with the composition (1% Co, 12% Cu, 87% Zn)$SO_4 \cdot Rb_2SO_4 \cdot 6H_2O$. Anisotropies of up to 44% were observed; variation with temperature was taken into consideration. The maximum ratio observed between the γ counts along the K_1 and K_2 axes, respectively, of the Co ions was 1.44 ± 0.05.

NUCLEAR REACTORS

998

National Bureau of Standards

GAMMA-RAY SPECTRA OF THE LOS ALAMOS REAC-

TORS; by J. W. Motz. [nd] Decl. Dec. 26, 1951. 9p. (AECD-3286; LADC-1060)

The γ-ray beams emerging from the collimator hole of the Los Alamos Water Boiler (operating at 30 kw) and of the Fast Reactor (operating at 25 kw) were allowed to impinge on a Be foil, and the momentum distribution of the Compton electrons ejected from the foil into a small solid angle in the forward direction of the beam was measured with a magnetic spectrometer. For the Water Boiler, the source of the collimated γ-ray was a U^{235} cylindrical slug (diameter 2.22 cm, length 0.426 cm, weight 28.5 g, 95% purity) placed at the center of the sphere, while for the Fast Reactor, the γ-rays originated in the reactor core. The spectrometer measurements covered a range of electron energies from ~0.5 to 12 Mev. "Hot wire" measurements indicated that the focusing properties of the spectrometer did not change over this energy range. The measurements for the Water Boiler and Fast Reactor were made with a Be foil 11 mils thick and 33 mils thick, respectively. (auth)

999

Los Alamos Scientific Lab.

A BRIEF DESCRIPTION OF THE LOS ALAMOS HOMOGENEOUS REACTOR, SUPO MODEL OF THE WATER BOILER; by L. D. P. King. Oct. 1951. Decl. Dec. 27, 1951. 17p. (AECD-3287; LADC-1081)

Rather extensive modifications on the Los Alamos Water Boiler (Hypo model) have resulted in a new model (Supo). These changes are detailed in this report, along with some of the operating characteristics of the modified reactor. (auth)

1000

[Oak Ridge National Lab., Y-12 Area]

CALCULATION OF AVERAGE LIFETIMES OF NEUTRONS USING THE RESULTS OF MULTIGROUP CALCULATIONS; by D. K. Holmes. Oct. 2, 1950. 6p. (Y-F10-15)

1001

WHAT ABOUT THE ATOMIC POWER PLANT ? Andrew W. Kramer. Power Eng. 55, 70-2, 132-4(1951) Dec.

The relation of the military reactors to the development of stationary power plants is discussed. The economic and thermodynamic aspects of nuclear-power-plant development, including operating factors involved in both high- and low-temperature plants are considered. No mathematical or experimental results are given.

1002

NORWAY REACTOR. Sci. American 185, 30-32(1951) Dec.

A portfolio of pictures shows the heavy-water reactor recently completed near Oslo by Norway and the Netherlands. Built without secret information, it is much like the reactor at Argonne National Laboratory.

NUCLEAR TRANSFORMATION

1003

Atomic Energy Research Establishment, Harwell, Berks (England)

SHELL MODEL CALCULATION OF THE PHOTODISINTEGRATION OF C^{12} INTO THREE ALPHA-PARTICLES; by M. J. Brinkworth and T. H. R. Skyrme. [nd] 16p. (AERE-T/R-802)

The photodisintegration of C^{12} into three α particles is calculated on the assumption of a direct transition to the 2.9-Mev level of Be^8 with spin 2. Shell model wave functions are used. Agreement with experiment is not obtained, but it would appear that the observed photodisintegration can be explained at least as well by an independent particle model as by an α-particle model. (auth)

1004

Radiation Lab., Univ. of Calif.

DISINTEGRATION OF HELIUM BY 90-MEV NEUTRONS (abstract); by P. Tannenwald. Dec. 4, 1951. 1p. (UCRL-1593)

The report comprises an abstract of a paper for the New York meeting of the American Physical Society, Jan. 31, 1952, and is reproduced here in its entirety.

90-Mev neutrons produced by stripping 190-Mev deuterons in the 184-in. cyclotron were collimated and sent through a 22-in. Wilson cloud chamber filled with helium gas to a total pressure of 81 cm Hg. The chamber was operated in a pulsed magnetic field of 21,700 gauss. The possible reaction products are: triton-deuteron, 2 deuterons-neutron, triton-proton-neutron, deuteron-proton-2 neutrons, 2 protons-3 neutrons, He^3-2 neutrons, He^4 recoils. The particles from the two-prong stars are identified by curvature and relative ionization, and the single tracks by characteristic track endings when they end in the chamber. For the first three reactions it is possible to calculate, from measured quantities, the energy of the incident neutron. Of the 90 two-prong stars which have been analyzed so far, there are 18 dt, 10 dd, 47 pt, 14 pd, 1 pp. 59 He^4 tracks ended in the chamber and 78 other single tracks were observed which did not end. All these events occurred within an angle of $\pm 30°$ to the horizontal plane containing the neutron beam. Relative cross sections and energy and angular distributions will be presented.

1005

Radiation Lab., Univ. of Calif.

SUMMARY OF THE RESEARCH PROGRESS MEETING OF NOVEMBER 1, 1951; by S. Shewchuck. Dec. 11, 1951. 3p. (UCRL-1603)

The Photo Production of Negative Mesons from Deuterium. Richard Madey. Evidence was presented for the observation of the photomeson production process $\gamma + n \rightarrow \pi^- + p$. The photon source is the 322 Mev bremsstrahlung of the Berkeley synchrotron. Pion-proton coincidences were observed at pion laboratory angles of 90 and 120°. Correlated proton angles are predicted from the conservation laws for the photoproduction of a pion from a free neutron at rest. The predicted pairs of correlated meson and proton angles remain very nearly the same over all photon energies in the region of interest. Furthermore, the upper energy limit of the bremsstrahlung spectrum restricts the protons to an angular region in the forward direction within less than about 60° from the beam direction. The effect of the loose binding of the neutron in deuterium imparts a calculable smearing of the angle and energy correlations. When the angle of the proton telescope is varied to 7° on either side of the associated correlation angles, the difference in the counting rates between heavy water and ordinary water shows a well-defined peak at the predicted proton angles of 31.5 and 20°. Photo Production of Negative Pions from Deuterium. R. E. LeLevier. The meson energy spectrum for fixed recoil angles of meson and proton in photo-π^- production from deuterium was calculated using the impulse approximation (G. Chew, Phys. Rev. 80, 196(1950)) and a phenomonological spin-dependent interaction (M. Law and H. Feshbach, Phys. Rev. 81, 189(1951)). The spectrum is peaked near the unique energy which results at given free neutron production angles. The main portion of the spectrum is essentially given by $\phi_0^2(k)$ where $\phi_0(k)$ is the Fourier transform of the deuteron wave function and k is the momentum of the original proton in the deuteron. For a given meson energy the conservation laws determine k. If the final protons are in a singlet spin state there is a sharp rise in the spectrum at the maximum possible meson

energy. This is due to a large increase in the phase-space factor and to the ^1S proton-proton interaction. The experimental ratio of the height of the "spike" to that of the central peak would provide a measure of the spin flip process since there is no spike if the final protons are in a spin triplet state. (Entire report)

1006

Radiation Lab., Univ. of Calif.

SUMMARY OF THE RESEARCH PROGRESS MEETING OF NOVEMBER 8, 1951; by S. Shewchuck. Dec. 10, 1951. 6p. (UCRL-1604)

Results of measurements of impurities of gases in the mass spectrometer show good accuracy. Arbitrarily, another gas (1% Ne) is added to serve as interval standard if peaks are not well defined. Al^{24} was investigated as a possible heavy-particle emitter but no conclusive results were obtained.

1007

CROSS SECTION MEASUREMENTS OF THE $N^{14}(n,\alpha)B^{11}$ AND $N^{14}(n,p)C^{14}$ REACTIONS WITH MONOCHROMATIC d-d NEUTRONS. W. Bollmann and W. Zünti. Helv. Phys. Acta 24, 517-50(1951) Nov. 20. (In German)

The variation of the cross sections of the $N^{14}(n,\alpha)B^{11}$ and the $N^{14}(n,p)C^{14}$ reactions was measured with monochromatic d-d neutrons in the energy range 2 to 3.6 Mev. (n,α) resonances were found at neutron energies of 2.26, 2.56, and 2.75 Mev, and (n,p) resonances at 2.26 and 2.80 Mev. Different methods of determination of Q-values are discussed. A description of a simple photographic pulse-height spectrometer is included. (auth)

1008

THE $Al^{27}(d,p)Al^{28}$ AND $Al^{27}(d,d')Al^{27}$ REACTIONS. K. K. Keller. Phys. Rev. 84, 884-6(1951) Dec. 1.

A large heavy-particle magnetic spectrometer was used to study the proton and deuteron groups from the deuteron bombardment of a thin Al foil. Charged particles emitted at 90° with respect to the incident deuteron beam were analyzed by momentum in an annular-shaped magnetic field. Groups of protons and deuterons correspond to excited states in Al^{28} and Al^{27}, respectively. Fifteen groups of protons from the reaction $Al^{27}(d,p)Al^{28}$ were observed. Their Q values were 5.53, 4.49, 3.95, 3.36, 3.01, 2.06, 1.55, 0.70, 0.37, −0.27, −0.60, −0.84, −1.37, −1.86, and −2.98 Mev. The elastically scattered deuterons and five groups of inelastically scattered deuterons were also observed. Their Q values were 0, −0.97, −2.39, −3.17, −4.74, and −5.76 Mev. (auth)

1009

INTERNAL PAIR SPECTRUM FROM B^{10} + d. S. J. Bame, Jr. and L. M. Baggett. Phys. Rev. 84, 891-7(1951) Dec. 1.

A magnetic lens pair spectrometer has been used to measure the energy spectrum of the internal pairs formed from the bombardment of B^{10} with deuterons. The spectrometer has been calibrated with the nuclear pair from F^{19} + p with an energy of 6.05 ± 0.03 Mev. The B^{10} spectrum shows γ rays of energies 4.43 ± 0.07, 6.51 ± 0.13, 6.75 ± 0.13, 7.34 ± 0.20, and 8.93 ± 0.13 Mev. Unresolved lines appear to exist in the region 4.5 to 5.5 Mev. The 6.51 Mev line is tentatively assigned to C^{11} while the other lines can be attributed to B^{11*}. (auth)

1010

THE ALPHA-PARTICLE DISINTEGRATION OF BERYLLIUM. William O. McMinn, M. B. Sampson, and V. K. Rasmussen. Phys. Rev. 84, 963-6(1951) Dec. 1.

The disintegration of Be^9 by 21.7-Mev α particles has been studied with observations of the emitted particles made at various angles. Q values of −6.92, −7.87, −8.57, and −10.74 Mev were found for the $Be^9(\alpha,p)B^{12}$ reaction giving levels in B^{12} at 0.95, 1.65, and 3.82 Mev. Two groups of deuterons from $Be^9(\alpha,d)B^{11}$ were found giving a level in B^{11} at 2.18 Mev. A third group, if assigned to this reaction, would give a level in B^{11} at 0.65 Mev. The inelastic scattering $Be^9(\alpha,\alpha')Be^{9*}$ gives a level in Be^9 at 2.63 Mev. (auth)

1011

EXCITED STATES OF F^{19} FROM $O^{16}(\alpha,p)F^{19}$. M. Loren Bullock and M. B. Sampson. Phys. Rev. 84, 967-8(1951) Dec. 1.

Oxygen gas has been bombarded with 20.6-Mev α particles, and the resulting proton groups have been studied using a proportional counter. The energies of the proton groups were measured by their range in aluminum. Q values of −8.08, −9.44, −10.75, and −12.00 Mev were obtained giving levels in F^{19} at 1.36, 2.67, and 3.92 Mev. (auth)

1012

CROSS SECTION FOR THE REACTION $Cu^{65}(\gamma,\alpha)Co^{61}$. R. N. H. Haslam, L. A. Smith, and J. G. V. Taylor. Phys. Rev. 84, 840-2(1951) Nov. 15.

The $Cu^{65}(\gamma,\alpha)Co^{61}$ cross section has been measured. Samples of $CuCl_2 \cdot 2H_2O$ were irradiated in a betatron x-ray beam, and the Co was separated by chemical dissolution and precipitation. The activation curve and cross-section curve for the reaction are shown. At 24 Mev the yield of α particles was 2.3×10^4 per mole of Cu^{65} per roentgen. The cross section has a maximum value of 1.5 mb at 22 Mev, and the integrated cross section to the peak is 6.2×10^{-3} Mev barns. The activation curves for $Ta^{181}(\gamma,n)Ta^{180}$, which was used to monitor the experiment, and $Rb^{87}(\gamma,\alpha)Br^{83}$ were redetermined, and the revised curves are shown.

1013

THEORY OF NUCLEAR PHOTOPROCESSES. R. G. Sachs. Phys. Rev. 84, 845(1951) Nov. 15.

In a recent paper (Zhur. Eksptl'. i Teoret. Fiz. 20, 669, 944(1950)) on deuteron photodisintegration, Avak'yants predicted that the electrical dipole cross section at 40 or 50 Mev is greatly increased over the usual theoretical value as a result of exchange currents. It is now shown that his result is incorrect and that calculation with the ordinary electric dipole-moment operator is correct, as orginally suggested by Siegert (Phys. Rev. 52, 787(1937)).

1014

DETECTION OF CIRCULARLY POLARIZED γ RAYS AND THE PRODUCTION OF POLARIZED ELECTRONS. Otto Halpern. Nature 168, 782(1951) Nov. 3.

Results which may be expected from possible experiments with circularly polarized γ rays are suggested. Choosing a special case of the Compton effect in which the quantum is scattered backward and the electron forward, one finds that for moderately large quanta ($h\nu/mc^2 \gtrsim 3$) and an unpolarized electron initially at rest, the scattered electron is almost totally polarized, its spin pointing in the direction of propagation. If the electron is initially suitably polarized, the scattering cross section will vary between zero and twice the value obtained from an unpolarized electron.

1015

NUCLEAR EXCITATION FUNCTIONS, $Se^{82}(d,2n)Br^{82}$ AND $Br^{81}(d,p)Br^{82}$. John A. Miskel and Arthur C. Wahl. Phys. Rev. 84, 700-2(1951) Nov. 15.

The cross section of the $Se^{82}(d,2n)Br^{82}$ reaction was found to rise rapidly with deuteron energy, increasing from zero between 3 and 4 Mev to 0.93 barn at 9.7 Mev. The cross section of the $Br^{81}(d,p)Br^{82}$ reaction was redetermined around 9 Mev, which is near the maximum of the curve, and was found to be 0.17 barn. (auth)

1016
ENERGY RELEASE IN THE DISINTEGRATION OF Be^8. Richard R. Carlson. Phys. Rev. 84, 749-57(1951) Nov. 15.

Thin Be targets were bombarded with 400-kev protons and the energy spectra of the particles given off at 90° to the beam direction were observed with a cylindrical electrostatic analyzer. The Be was evaporated onto a Ni backing which was thin enough to confine the elastically scattered protons to a narrow energy range. At energies below that of the elastically scattered protons, peaks were observed in the energy spectra which corresponded to the maximum α-particle energy in the continuous energy distribution of α particles resulting from the breakup of Be^8. The position of these maxima give a value for the energy release in the disintegration of 77.5 ± 4 kev. (auth)

1017
TOTAL REACTION CROSS SECTIONS FOR Be, C, N, AND Na FOR FAST 2- TO 3.7-MEV NEUTRONS. R. Ricamo and W. Zünti. Helv. Phys. Acta 24, No. 4, 302(1951) Sept. 20. (In German)

Some results of measurements of total cross sections in the 2- to 3.7-Mev neutron-energy region are reported briefly. Be was found to have a single, broad, unsymmetrical maximum of 3.3 barns at 2.75 Mev. A new peak was found for C at 2.08 Mev with a half width of only 50 kev; the cross section ranges from 1.6 to 2.4 barns. Maxima were found for N at 2.22, 3.1, and 3.55 Mev. A complex structure was found for the Na cross section, with abrupt oscillations between 2.0 and 3.4 barns.

1018
(n, α) REACTION ON O^{16}. P. Huber, E. Baldinger, and W. G. Proctor. Helv. Phys. Acta 24, No. 4, 302-4(1951) Sept. 20. (In German)

A 19-channel pulse analyser was used to study the $O^{16}(n,\alpha)C^{13}$ reaction. With carefully calibrated neutrons of 4.09 ± 0.06-Mev energy, the Q value of the reaction was found to be 2.38 ± 0.16 Mev.

1019
ENERGY REQUIREMENTS FOR NUCLEAR TRANSFORMATIONS. Benjamin Carrol and Peter F. E. Marapodi. J. Chem. Education 28, 586-7(1951) Nov.

It is shown that calculation of energy requirements for a nuclear reaction are often incorrect because the principle of the conservation of momentum is neglected.

1020
THE DEUTERON PHOTO-DISINTEGRATION BY THE LITHIUM GAMMA-RAYS. H. Wäffler and S. Younis. Helv. Phys. Acta 24, 483-507(1951) Nov. 20.

The photodisintegration of the deuteron by the γ rays arising from the reaction $Li^7(p,\gamma)Be^8$ ($h\nu$ = 17.6 and 14.8 Mev) has been investigated using the photographic plate technique. The angular distribution of the emitted photoprotons as well as the total cross section of the reaction has been determined. From a total of 2000 observed tracks the following results are obtained for both γ lines together: (1) The angular distribution in the center-of-mass system is of the form $0.12 + \sin^2\Theta\,(1 + 0.24\cos\Theta)$ It confirms within the limits of error the retardation effect calculated by Marshall and Guth (Phys. Rev. 78, 738(1950)). (2) The total cross section has the value $\sigma_{tot} = (8.34 \pm 1.0) \times 10^{-28}$ cm_2. A discussion of these results from the point of view of the meson theory of nuclear forces is given. (auth)

1021
EXCITATION FUNCTIONS OF THE (p,n) REACTION. III. LIGHT ELEMENTS. J.-P. Blaser, F. Boehm, P. Marmier, and P. Scherrer. Helv. Phys. Acta 24, 465-82(1951) Nov. 20. (In French)

The excitation functions of the (p,n) reaction on Li^7, B^{11}, C^{13}, O^{18}, F^{19}, Na^{23}, $Mg^{25,26}$, Al^{27}, and Cl^{37} have been measured for proton energies ranging from the threshold up to 6.8 Mev. Three different methods are used according to the various radioactivities produced. The levels excited in the compound nuclei and the absolute cross sections are given and discussed. (auth)

1022
EXCITATION FUNCTIONS AND CROSS SECTIONS OF THE (p,n) REACTION. II. J.-P. Blaser, F. Boehm, P. Marmier, and P. Scherrer. Helv. Phys. Acta 24, 441-64(1951) Nov. 20. (In German; see also NSA 5-3766)

Absolute cross sections and excitation functions for the (p,n) reaction have been investigated for 60 nuclei and isomers of the elements Ni, Ga, As, Se, Br, Rb, Sr, Y, Zr, Nb, Mo, Ru, Rh, Pd, Cd, In, Sn, Sb, Te, I, Cs, Ba, La, Ce, Pr, Nd, and Gd. Cross sections for an incident proton energy of 6.7 Mev are plotted as functions of Z and compared with Weisskopf's new theoretical values. r_0 is shown to be independent of Z and to have a mean value of 1.5×10^{-13} cm. The method of stacked foils is used for excitation functions. The nuclei Ni^{60}, Zr^{90}, and Sn^{116} give extremely low cross sections. These low values may be due to the filling up of both proton and neutron shells, if one considers 32, 40, and 66 to be "semi-magic" numbers indicating the filling up of a subshell. Nb^{93} also shows low (p,n) cross section. Its excitation function has been measured and possible causes for this anomaly are discussed. (auth)

1023
TOTAL REACTION CROSS SECTIONS OF THE ELEMENTS Be, C, AND O FOR NEUTRONS IN THE ENERGY RANGE 1.9 TO 3.8 MEV. R. Ricamo and W. Zünti. Helv. Phys. Acta 24, 419-40(1951) Nov. 20. (In German)

A detailed investigation of the total cross section for neutrons with energies from 1.9 to 3.8 Mev is made by measuring the transmission of C, Be, and BeO samples. Deuterons falling on a thin heavy-ice target provide the nearly monochromatic neutrons. The properties of an anthracene crystal as an efficient fast neutron detector are discussed. An analysis is made of the sources of error in the transmission method. New sharp resonances were found in the cross section of carbon at 2.09 and 2.95 Mev, and in the cross section of oxygen at 1.89 and 3.75 Mev, as well as a pronounced negative resonance at 2.35 Mev. A tentative explanation of this phenomenon is given. (auth)

PARTICLE ACCELERATORS

1024
Medical Research Council (Great Britain)
NOTES ON A TOUR OF AMERICAN FIXED-FREQUENCY CYCLOTRONS IN THE AUTUMN OF 1950; by J. W. Gallop. [nd] 116p. (NP-3537; Library No. 533)

Part I of the report discusses the design of the principal components of 12 American fixed-frequency cyclotrons. Part II summarizes the information collected at each laboratory. Part III lists 84 of the references used throughout the report.

1025
TROCHOIDAL ORBITS IN SYNCHROCYCLOTRONS. U. E. Kruse, R. A. Mack, and N. F. Ramsey. Rev. Sci. Instruments 22, 839-40(1951) Nov. (Laboratory and shop note)

Low-energy protons have been observed under certain circumstances in orbits that are far different from the standard synchrocyclotron orbit. This current was observed only when the oscillator frequency and the magnetic

field at the probe radius were appropriate to the rest-energy cyclotron frequency of the proton. This anomalous current was attributed to particles of low energy which were following trochoidal paths in the cyclotron instead of originating in the center and expanding outward in the usual cyclotron orbit.

1026

THE HELIX AS A LINEAR ACCELERATOR FOR PROTONS. D. R. Chick and D. P. R. Petrie. Nature 168, 782-3 (1951) Nov. 3.

Designs proposed for construction of a linear accelerator for increasing the energy of the protons from the 4-Mev electrostatic generator of the research laboratory, Associated Industries, Aldermaston, Berks, to 20 Mev are briefly discussed. A circular wave guide of 1-cm radius and 11 m long, made up of a closely wound helical wire, is proposed.

RADIATION ABSORPTION AND SCATTERING

1027

Atomic Energy Research Establishment, Harwell, Berks (England)

THE RELATION BETWEEN ELECTRON CURRENT AND FORWARD TARGET RADIATION INTENSITY IN HIGH ENERGY ELECTRON ACCELERATORS; by J. D. Lawson. Oct. 9, 1951. 10p. (AERE-G/R-786)

An expression is derived for the forward radiation intensity per unit solid angle from a high-energy electron accelerator in terms of the target thickness and electron energy. This expression is valid for energies above about 6 Mev and target thicknesses of less than 0.1 radiation length. It is shown however that a reasonable estimate (to within about 15%) can be made quite easily for considerably thicker targets over quite a wide range of energy and of target materials. A measurement of the forward radiation from a linear accelerator operating at 7.3 Mev was made and found to be in satisfactory agreement with theory. (auth)

1028

Ames Lab.

CLOUD CHAMBER MEASUREMENT OF ELECTRON PAIRS FOR DETERMINATION OF SYNCHROTRON SPECTRUM; by Richard H. Stokes and L. Jackson Laslett. June 1951. 26p. (ISC-161)

The x-ray spectrum of the Iowa State College synchrotron operating at 65 Mev has been measured by observing, in a magnetic cloud chamber, the momentum of each member of the electron pairs produced in the air filling of the chamber. The results are in agreement with the energy spectrum predicted by the Bethe-Heitler theory. During observation of a portion of the data, the synchrotron beam intensity was monitored and related to the reading of a Victoreen thimble ionization chamber in a single-ended lead cylinder ⅛ in. thick. This procedure enabled a value to be obtained for the flux of quanta and energy, related to the reading of the Victoreen chamber in r units. A quantum flux of 6.6×10^7 quanta/cm^2/r was obtained for the energy flux. These values are in agreement with independent work and will enable absolute values of the cross section for nuclear γ reactions to be made. The method used for measurement of the stereoscopically projected electron tracks is described, and expressions are derived for obtaining the magnitude of the electron momentum from the measured quantities.

1029

Rochester Univ.

PROTON-PROTON SCATTERING AT 240 MEV BY A MAGNETIC DEFLECTION METHOD; by O. A. Towler, Jr. Nov. 19, 1951. 25p. (NYO-3034)

Differential cross sections for p-p scattering have been measured at eight angles ranging from 171.3 to 108.1° (c.m.) by magnetically deflecting protons scattered by hydrocarbon and carbon targets into photographic plates placed inside the tank of the Rochester 130-in. cyclotron. The incident beam was monitored by the β activity induced in the target by the reaction $C^{12}(p,pn)C^{11}$, the absolute value of the cross section being based on a 49 ± 3 mb carbon cross section. The measured cross section is isotropic within statistical errors from 108° to 167°, with an average value of 4.66 ± 39 mb/steradian, and increases sharply to a value of 15.8 ± 1.6 mb at 171.3°. (auth)

1030

Radiation Lab., Univ. of Calif.

HIGH ENERGY ELECTRON-ELECTRON SCATTERING (thesis); by F. C. Gilbert. Dec. 1951. 41p. (UCRL-1506(Rev.))

A new approach to the problem of measuring the electron-electron scattering cross section has been attempted using electron sensitive nuclear emulsions in place of the usual cloud chamber. Two-hundred Mev electrons obtained by magnetic analysis of pairs converted in the synchrotron beam were allowed to impinge upon Ilford G-5 emulsions. The relatively high density of electrons ($\sim 10^{24}$/cm^3) in emulsion reduces the length of track necessary to obtain sufficient statistics. The primary electron tracks were followed under approximately 500× magnification, and 4.27 electron-electron scattering events were recorded in which the scattered electron of lower energy had an energy greater than 30 kev. The knock-on energy was determined by measuring either the range or the angle between the knock-on and primary tracks. The average energy of a primary electron causing a knock-on was less than 200 Mev due mainly to radiation losses in the emulsion, and was estimated to be 185 Mev. The observed absolute differential cross section, as a function of knock-on energy, was found to be consistent with Moeller's theoretical cross section, although the integrated cross section was 14% low. At this primary energy, an insufficient number of events of large energy transfer were observed to detect exchange, spin, and retardation effects, and actually only the classical relativistic theory was verified. (auth)

1031

A THEORETICAL CALCULATION OF THE INELASTIC SCATTERING OF 90-MEV NEUTRONS BY DEUTERONS. Geoffrey F. Chew. Phys. Rev. 84, 710-16(1951) Nov. 15.

The number and distribution of disintegration protons to be expected from the $H^2(n,p)$ reaction at 90-Mev incident neutron energy is calculated phenomenologically. No assumption about the character of nuclear forces is required, the impulse approximation allowing direct use of high energy n−p and p−p scattering data. Agreement with experiment is satisfactory, there being no evidence for a difference between n−n and p−p interactions. (auth)

1032

THE STOPPING POWER OF METALS AND SEMICONDUCTORS. Z. H. Heller and D. J. Tendam. Phys. Rev. 84, 905-9(1951) Dec. 1.

Stopping-power measurements have been made on Si, Ni, Cu, Ge, Zr, Rh, Ag, Sn, and Au. The reduction in range of the cyclotron deuteron beam produced by samples of these materials was determined by measurement of the ionization in air at the end of the beam path. To evaluate the ionization curves a semiempirical curve, given here, which relates extrapolated ranges with mean number ranges was computed for large straggling parameters. A range-energy curve for deuterons in Ge is given as well as approximate air and Al equivalents for Si and Ge.

Range-energy curves were measured for the metals. The semiconductor results were compared with those for the metals to determine whether the difference in electrical properties produces a difference in energy loss. No difference was detected within the limits of precision of this experiment. Combining data from this experiment with those of other investigations a study of the dependence of stopping power on velocity and atomic number has been made. An empirical formula derived from these data expresses the electronic stopping power relative to Al as a function of energy and atomic number over a wide range. A formula is provided for using this relation to calculate range-energy curves in any element with Z > 10, and its validity is discussed.

1033

ALPHA-ALPHA SCATTERING. C. H. Braden, S. M. Carter, and A. G. Ford. Phys. Rev. 84, 837(1951) Nov. 15.

The differential-scattering cross sections for cyclotron-accelerated 20.4 ± 1.0-Mev α particles by He have been determined at scattering angles of 60 and 90° (c.m.). Results in barns/sterad were as follows: $\sigma_{60°} = 0.086(\pm 5.5\%)$; $\sigma_{90°} = 0.14(\pm 5.5\%)$. The reasons for the discrepancy between the present values and the value $\sigma_{60°} = 0.123 \pm 0.008$ obtained by Mather (Phys. Rev. 82, 126(1951)) are not understood.

1034

SCATTERING OF RADIATION BY ELECTRONS IN RELATIVISTIC QUANTUM MECHANICS. Otto Halpern and Harvey Hall. Phys. Rev. 84, 997-1008(1951) Dec. 1.

The theory of the scattering of radiation by Dirac electrons is revised and extended. Assuming negative energy states unoccupied, a formula for the cross section of coherent scattering of very hard quanta is derived. It is, furthermore, shown that the previously claimed and accepted one-to-one correspondence of the matrix elements for the cases of free or occupied negative energy states is generally untrue. It can be proved that for moderately small quanta the cross sections of coherent and incoherent scattering by bound electrons are approximately the same in the case of unoccupied negative energy states and in the pair theory proper. Characteristic differences are shown to exist for very hard radiation. The historical development of the problems here treated is also discussed. (auth)

1035

SCATTERING OF 15.7-MEV ELECTRONS BY NUCLEI. E. M. Lyman, A. O. Hanson, and M. B. Scott. Phys. Rev. 84, 626-34(1951) Nov. 15.

Electrons removed from the 20-Mev betatron are focused to a 0.08-in. spot about 10 ft. from the betatron by a magnetic lens. The electrons impinge on thin foils at the center of a highly evacuated scattering chamber having a diameter of 20 in. Elastically scattered electrons, selected by a ⅜ in. × 2 in. aperature, are focused by means of a 75° magnetic analyzer with 3% energy resolution and are detected by coincidence Geiger counters. Corrections are applied for multiple scattering and for energy losses which remove the electrons from the range of energies accepted by the detector arrangement. The scattering cross section for gold at 150° is found to be about 2.6 times that given by Mott's formula in the Born approximation and about one-half of that expected for the scattering by a point nucleus. This result is in good agreement with the calculations for electrons of this energy if the nuclear charge is assumed to be distributed uniformly throughout the nuclear volume.

The results for the scattering from C, Al, Cu, and Ag are also in agreement with the assumption of a uniformly distributed nuclear charge within the uncertainties involved in the theory and the experimental results. (auth)

1036

MEASUREMENT OF MULTIPLE SCATTERING OF 15.7-MEV ELECTRONS. A. O. Hanson, L. H. Lanzl, E. M. Lyman, and M. B. Scott. Phys. Rev. 84, 634-7(1951) Nov. 15.

The angular distribution of electrons scattered by thin Be and Au foils has been measured for angles where the multiple scattering is important. The 1/e widths of the distributions obtained with Au foils of 18.66 and 37.28 mg/cm^2 are 2.58° and 3.76°, respectively. These widths are about 10% narrower than those calculated from the theories of Williams or of Goudsmit and Saunderson but are in good agreement with the calculations of Molière (Z. Naturforsch. 3a, 78(1948)).

The 1/e widths obtained with Be foils of 257 and 495 mg/cm^2 are 3.06° and 4.25°. These widths are about 5% smaller than those given by Molière's theory increased by $(1+1/Z)^{1/2}$ for the contribution of electron-electron collisions. The discrepancy may be qualitatively explained by the fact that the Thomas-Fermi screening used in the calculation is different from the effective screening in the Be metal.

The scattering from the two Au foils was measured for larger angles where the scattering can be considered as single scattering modified by the effect of multiple scattering. The ratio of the scattering from the thick to the thin foil can be represented by the relation $2+95/\theta^2$ from 9° to 30°, and is in fair agreement with theoretical expressions for this ratio. (auth)

1037

ELECTRON-ELECTRON SCATTERING AT 15.7-MEV. M. B. Scott, A. O. Hanson, and E. M. Lyman. Phys. Rev. 84, 638-43(1951) Nov. 15.

The differential scattering cross section for electron-electron scattering has been measured at relativistic energies. A focused beam of 15.7-Mev monokinetic electrons from the 22-Mev betatron was scattered by nylon foils in a scattering chamber. The incident current was collected by a Faraday cage after it had passed through the scattering foil and was measured by a vibrating-reed electrometer. The number of scattered electrons in a given momentum interval chosen by a magnetic analyzer was counted by a Geiger counter.

The energy of the scattered electrons was measured as a function of the scattering angle and was found to be in agreement with the laws of relativistic mechanics within an experimental accuracy of 0.4%.

For the electron-electron collisions the relative scattering cross sections agree with the Møller formula. For the electron-nuclear collisions they agree with the relativistic Mott theory (Born approximation) corrected for the radiative losses.

The absolute differential scattering cross sections for the electron-nuclear scattering were measured at angles between 10 and 43°. The average of the absolute values was 2% lower than theory.

The absolute differential scattering cross sections for electron-electron scattering were measured at the same set of angles. The average of these absolute cross sections was 7% lower than theory predicts. The bulk of the departure from theory may be due to a systematic error in the measurements.

1038

NEUTRON SCATTERING AND POLARIZATION BY FERROMAGNETIC MATERIALS. C. G. Shull, E. O. Wollan, and W. C. Koehler. Phys. Rev. 84, 912-21(1951) Dec. 1.

Neutron-diffraction studies are reported on a series of magnetized and unmagnetized ferromagnetic materials. The diffraction patterns for unmagnetized, polycrystalline

samples of Fe and Co are found to possess both nuclear and magnetic components with the latter in agreement with the magnetic scattering theory with respect both to intensity of scattering and form factor angular variation. Studies on the magnetic structure of Fe_3O_4 are shown to strongly support Néel's proposed ferrimagnetic structure (Ann. Physik 3, 137(1948)). Predictions of the theory regarding intensity effects upon sample magnetization are fully confirmed and the Schwinger-Halpern-Johnson formulation of the interaction function between the neutron's magnetic moment and the internal fields in a ferromagnet is substantiated. A pronounced variation of intensity around the Debye ring in the diffraction pattern for a magnetized sample is found. Neutron polarization effects in the Bragg scattered beams from magnetized crystals of Fe and Fe_3O_4 have been studied and it is shown that very highly polarized beams are obtained for certain reflections. This method of monochromatic beam polarization is found to compare very favorably with other methods with respect to polarization value, beam intensity, and ease of obtainment. (auth)

1039

APPROXIMATION METHODS IN THE THEORY OF SCATTERING. Marvin L. Goldberger. Phys. Rev. 84, 929-38 (1951) Dec. 1.

The quantum theory of scattering is discussed from the point of view of a time-independent formulation. A detailed discussion of the replacement of the ordinary integral equation of scattering by two others is given together with a discussion of the desirability of this procedure both from a physical and mathematical point of view. Variational formulations of these equations are given and their accuracy is indicated by comparison with examples for which exact solutions are known. An exactly soluble problem given by Blatt is treated from the standpoint of the present paper. A formal solution of the general scattering problem is developed and illustrated with Blatt's example. (auth)

1040

SCATTERING OF PROTONS BY ALPHA-PARTICLES. C. H. Braden. Phys. Rev. 84, 762-5(1951) Nov. 15.

Differential scattering cross sections for 5.10 ± 0.10-Mev protons by helium have been determined at laboratory angles from 30° to 150°. Probable errors in the cross sections varied from 2.4% at 30° to 4.1% at 150°. The scattered protons were detected by a proportional counter. The apparatus was calibrated by a study of proton-proton scattering. (auth)

1041

ON CORRELATION IN MULTIPLE SCATTERING IN A MAGNETIC FIELD. V. I. Ogievetskiĭ. Zhur. Eksptl'. i Teoret. Fiz. 21, No. 7, 775-9(1951) July. (In Russian)

Equations correlating displacements of charged particles undergoing multiple scattering in a constant magnetic field are derived.

1042

ON THE ANALYSIS OF ELASTIC SCATTERING OF NUCLEONS BY MESON FIELDS. C. Marty. J. phys. radium 12, 833-40(1951) Nov. (In French)

The cross sections for elastic scattering of nucleons by an arbitrary spin-0 or spin-1 meson field are calculated by a second-order approximation in the S matrix. The principle is applied to pure scalar, pseudoscalar, vector, and pseudovector fields. The validity of the method is discussed. It is found in particular that the pseudoscalar field may not be treated solely by a second-order approximation. The calculations are compared with results of high-energy experiments. No simple field of a particle with mass equal to that of the π meson gives satisfactory agreement with n-n and p-p scattering cross sections, nor does any mixture of neutral scalar mesons of mass m_π with charged mesons.

1043

ON THE THEORY OF SCATTERING OF NEUTRONS BY PROTONS. Theodor Sexl. Naturwissenschaften 38, No. 19, 454-5(1951) Oct. (Note; in German)

The concepts of Fermi's scattering length a and the effective range r_{eff} are related by the following equation for the scattering cross section:

$$\sigma = \tfrac{3}{4}\cdot 4\pi a_t^2 \left[1 + a_t k^2 \left(r_{eff}^t - a_t\right)\right] + \tfrac{1}{4}\cdot 4\pi a_s^2 \left[1 + a_s k^2 \left(r_{eff}^s - a_s\right)\right],$$

where s and t indicate the singlet and triplet state, respectively, and k is the usual wave function $2\pi\mu v/h$ (μ = reduced mass, v = neutron velocity).

RADIATION EFFECTS

1044

ELECTRON-HOLE PRODUCTION IN GERMANIUM BY ALPHA-PARTICLES. Kenneth G. McKay. Phys. Rev. 84, 829-32(1951) Nov. 15.

The number of electron-hole pairs produced in Ge by α-particle bombardment has been determined by collecting the internally produced carriers across a reverse-biased n-p junction. No evidence is found for trapping of carriers in the barrier region. Studies of individual pulses show that the carriers are swept across the barrier in a time of less than 2×10^{-8} sec. The counting efficiency is 100%. The energy lost by an α-particle per internally produced electron-hole pair is 3.0 ± 0.4 ev. The difference between this and the energy gap is attributed to losses to the lattice by the internal carriers. It is concluded that recombination due to columnar ionization is negligible in Ge. (auth)

1045

THE n-p-n JUNCTION AS A MODEL FOR SECONDARY PHOTOCONDUCTIVITY. Kenneth G. McKay. Phys. Rev. 84, 833-5(1951) Nov. 15.

A Ge n-p-n junction with the p region floating, has been subjected to α-particle bombardment. The transient currents resulting from individual incident alphas have been studied. This enables one to study the rate of decay of excess holes in the p-region. This decay time appears to increase with applied bias, pass through a maximum, and eventually approach a constant value. The total charge flowing across the unit, as a result of the bombardment by a single α particle, may become large; quantum yields of greater than 60 have been observed. The unit possesses many of the important characteristics of materials which exhibit "secondary photoconductivity." It is concluded that various forms of n-p-n barriers must therefore play an important role in such materials and that their understanding can be greatly facilitated by studies of n-p-n barriers in Ge. (auth)

RADIOACTIVITY

1046

Argonne National Lab.

EXPERIMENTAL DETERMINATION OF K/L RATIOS FOR $_{71}Lu^{175}$ AND $_{21}Sc^{46m}$ (20 seconds); by S. B. Burson and W. C. Rutledge. Dec. 1951. 1p. (AECU-1733; UAC-470)

The report comprises an abstract of a paper for the New York meeting of the American Physical Society, Jan. 31, 1952, and is reproduced here in its entirety.

Neutron activation of Hf^{174} produces 70-day Hf^{175}, which decays by K capture to Lu^{175}. In addition to the four γ rays of 0.089, 0.113, 0.228, and 0.342 Mev reported (Burson, Blair, Keller, and Wexler, Phys. Rev. 83, 62(1951)), two more of 0.318 and 0.431 Mev are found to be associated

with Lu^{175}. These are shown to be consistent with the proposed-energy-level scheme. By use of both the 180° β-ray spectrometer and the photographic spectrograph, K/L ratios were measured for most of the lines. The type of radiation is suggested for each γ ray, and spin and parity changes are assigned. To compare the two methods of measurement, the highly converted 0.342-Mev γ ray was used. A K/L ratio of 4.95 ± 0.25 was determined from area measurements of photodensitometer traces of the plates and found to be in good agreement with a value of 5.05 ± 0.15 determined from the spectrometer momentum plot. Thus the photographic method, when properly calibrated, provides a reliable means of K/L ratio determination for activities too short-lived to be measured by other methods. The isomeric transition in Sc^{46m} (20 sec) was measured as 0.185 Mev. A K/L ratio of 10 ± 3 is determined from the plate.

1047

Argonne National Lab.

ANGULAR CORRELATION AND INTENSITY OF INNER BREMSSTRAHLUNG FROM P^{32} AND RaE; by T. B. Novey. Dec. 1951. 2p. (AECU-1775; UAC-472)

The report comprises an abstract of a paper for the New York meeting of the American Physical Society, Jan. 31, 1952, and is reproduced here in its entirety.

The angular correlation between the beta particles and co-emitted inner bremsstrahlung has been measured in RaE. As in the similar experiments with P^{32} (Novey, Phys. Rev. 84, 145(1951)) the agreement of the correlation with that predicted by the theory of Knipp and Uhlenbeck (Physica 3, 425(1936)) and Bloch (Phys. Rev. 50, 472(1936)) is excellent. Absolute gamma per beta intensity measurements have also been made of the continuous gamma distributions in P^{32} and RaE. The radiation was detected using a NaI(Tl) scintillation-counter arrangement of the type described by Madansky and Rasetti (Phys. Rev. 83, 187 (1951)). Problems of escape peak intensities and contributions from Compton distributions at present limit the accuracy of the absolute intensities. Theoretical intensity distributions were calculated using the experimentally obtained beta-ray spectra of P^{32} and RaE. The agreement with theory is satisfactory for P^{32} but is not as good as reported by Rasetti and Madansky for RaE. The theoretical intensity for RaE is about one-third of that for P^{32} due to the abundance of lower energy beta particles from RaE but the experimental gamma intensity in RaE is about equal to that in P^{32}. A small amount of K x radiation was found superimposed upon the RaE gamma spectrum. The x-ray intensity was only a few per cent of the continuous gamma intensity. This is in disagreement with Bruner's (Phys. Rev. 84, 282(1951)) value of four conversion electrons per (theoretical) gamma, unless the electron emission occurs predominantly from outer shells.

1048

Argonne National Lab.

THE BETA SPECTRUM OF Tc^{99}; by Frank Wagner, Jr. and M. S. Freedman. Dec. 1951. 1p. (AECU-1781; UAC-471)

The report comprises an abstract of a paper for the New York meeting of the American Physical Society, Jan. 31, 1952, and is reproduced here in its entirety.

A thin (95 $\mu g/cm^2$) uniform sample, prepared by volatilization of NH_4TcO_4 in vacuo onto a 150 $\mu g/cm^2$ aluminum support, was examined in a double-lens spectrometer at 4% resolution. The Kurie plot, corrected by C_{2T} (Nakamura, Umezawa, and Takebe, Phys. Rev. 83, 1273 (1951)) with $|A_{ij}|^2/|T_{ij}|^2 = 6.60$ and with $|\int \underline{\alpha} \cdot \underline{r}|^2 = 0$ is quite straight from E_0 = 296 kev down to 60 kev, and definitely does not fit the α shape (S. I. Taimuty, Phys. Rev. 81, 461 (1951); Wu and Feldman, Phys. Rev. 82, 332(1951)). The contribution of backscattering from the aluminum foil was assayed by a comparison of the spectrum of Pm^{147}, also prepared by a vacuum volatilization technique using the trifluoro-acetyl acetonate, onto a 10 $\mu g/cm^2$ LC-600 film, with an added aluminum foil backscatterer. Without backscatterer present the Pm spectrum is linear from E_0 = 227 kev to 10 kev; with backscatterer, to 60 kev, deviating upward by 6% at 30 kev. Application of the ratio as a correction to Tc^{99} extends the straight line to ~35 kev. These results are in agreement with the shell model (Mayer, Moszkowski, and Nordheim, ANL-4626 (May 1951)) assignment for this transition, $g_{9/2} - d_{5/2}$, and furnish, together with the high-energy transition in Cs^{137} (Langer and Moffat, Phys. Rev. 82, 635(1951); also confirmed by the authors (to be published)), a second confirmation for a predominantly tensor interaction on the basis of spectral shape.

1049

EXISTENCE AND NATURE OF THE POSITIVE PARTICLES NEAR A SOURCE OF RADIUM E. F. C. Champion and A. A. Ahmed. Nature 168, 780(1951) Nov. 3.

Photographs were made of cloud-chamber tracks of particles emitted from a radium E source situated outside the chamber, across the center of which was stretched a foil of Al of 0.046 g/cm^2. Of 12,000 tracks some 20 proceeded from the source with a curvature opposite to that of the negative β particles. Applying more rigorous criteria for positive particles, 3 tracks could be chosen, 2 of a H_ρ of about 2400, and one of 3600. The only values of e and m which could satisfy the observed values of H_ρ are considered to be $e = e_0/2$ and $m = m_0/2$ or zero, where e_0 and m_0 are those of an electron. One of the particles observed traverses the foil with little loss of energy. The positive nature of the particles could not be definitely proved.

1050

THE RADIOACTIVITY OF Se^{73}. F. R. Scott. Phys. Rev. 84, 659-65(1951) Nov. 15.

The disintegration of Se^{73} results in four positron groups with end-point energies and relative intensities of 1.68 Mev, 1.2%; 1.318 Mev, 87.4%; 0.750 Mev, 10.3%; and 0.250 Mev, 1.1%. Four nuclear γ rays are observed having energies of 67.1 kev, 361 kev, 860 kev, and 1.31 Mev. The K/L ratio of the internally converted electrons from the 67.1-kev and 361-kev γ-ray transitions are 7.6 and 8.6, respectively, K-capture—positron branching ratios are measured as 0.45 for the 1.318-Mev positron transitions, 1.6 for the 0.750-Mev positron transition and estimated as 6 for the 0.250-Mev positron transition. Measurement of the K-Auger electrons indicates a gross K-capture—positron ratio of 0.59. (auth)

1051

THE DECAY SCHEME OF Cu^{66}. H. Roderick, W. E. Meyerhof, and L. G. Mann. Phys. Rev. 84, 887-90(1951) Dec. 1.

The decay scheme of Cu^{66} has been investigated using scintillation detectors. The half life of Cu^{66} was found to be 5.17 ± 0.07 min. The main β-ray spectrum has an end point of 2.7 ± 0.1 Mev. 5.5 ± 1.5% of the β rays lead to an excited state of 1.05 ± 0.03 Mev in Zn^{66}. The half life of this excited state is less than 5×10^{-9} sec. These results agree with the recent investigations of Friedlander and Alburger, but imply the necessity for further study of the decay scheme of Ga^{66}, which also decays to Zn^{66}. Spin, parity and shell model assignments of the pertinent states of Cu^{66}, Zn^{66}, and Ga^{66} are proposed. (auth)

1052

THE SECOND TRANSITION IN THE DECAY OF Sn^{119m}. J. C. Bowe and P. Axel. Phys. Rev. 84, 939-43(1951) Dec. 1.

The photons from the second transition in Sn^{119m} were detected by using two proportional counters in coincidence. These photons have an energy of 23.8 ± 0.6 kev and could be differentiated from In x-rays only by coincidence measurements. The fraction of the second transitions which emits photons is 0.13 ± 0.03, corresponding to a total conversion of 7.3 ± 1.7. The slow neutron activation cross section of Sn^{118} was found to be 0.01 barn. (auth)

1053
K-CAPTURE IN SPECIAL ZONES. M. A. Levitskaya and L. P. Rapoport. Doklady Akad. Nauk S.S.S.R. 79, 953-5(1951) Aug. 21. (In Russian; cf. NSA 2-1232, 4-657, and 4-4700)

When the number of K-capturing nuclei, the K-capture half life, or the number of isomers of stable nuclei for each value of Z are plotted against Z, grouping along the Z axis is observed. The shape of the groups and related β-decay groupings are discussed.

THEORETICAL PHYSICS

1054
A PHENOMENOLOGICAL THEORY OF THE LAMB SHIFT AND OF ANOMALOUS MAGNETIC MOMENTS. Frederik J. Belinfante. Phys. Rev. 84, 949-56(1951) Dec. 1.

If one assumes that self-interactions do not exist and can be ignored, the explanation of the anomalous magnetic moments of proton and electron and the Lamb shift require new types of interaction between protons, photons, and electrons. A theory with such additional interactions is here developed in gauge-independent form, thus avoiding longitudinal and scalar photons throughout. The covariance of the formalism is proved. The resulting modification of Maxwell's equations for charged elementary particles in the vacuum involves only the introduction of an intrinsic polarization and magnetization of elementary particles, so that these equations for the vacuum now take the familiar form of the macroscopic Maxwell equations in matter. A further modification of the Dirac equation for electrons and protons involves the introduction of a delta-function interaction between them, opposite in sign to the Coulomb interaction. It is indicated how one can derive an energy density tensor for this theory. It is then shown how this formalism explains the anomalous moments and the Lamb shift. The three new interaction constants are adjusted to the experimental data. The dependence of the Lamb shift on the quantum numbers automatically comes out to be nearly the same and the dependence on the atomic number to be exactly the same as in the theory of Bethe, French, and Weisskopf. (auth)

1055
RENORMALIZATION THEORY OF THE INTERACTIONS OF NUCLEONS, MESONS, AND PHOTONS. J. C. Ward. Phys. Rev. 84, 897-901(1951) Dec. 1.

A general program for the removal of divergencies from the theory of the interactions of nucleons, mesons, and photons is formulated. It is shown that the procedure is equivalent to renormalization of the constants of the theory. (auth)

1056
A NEW COVARIANT AUXILIARY CONDITION FOR QUANTUM ELECTRODYNAMICS. Frederik J. Belinfante. Phys. Rev. 84, 644-7(1951) Nov. 15.

The covariant auxiliary condition (Schwinger, Phys. Rev. 75, 651(1949)) is assumed to be valid for all states occurring in nature. Such special assumptions as the condition for a "photon vacuum" of the noncovariant type then become superfluous. The meaning of the new auxiliary condition is that the expectation value of the electromagnetic field is equal to that of the retarded field from charged matter: "All light has once been emitted." If in some discussion of properties of a particular photon one wants to ignore the source of that particular photon (without denying its existence), one can ignore these equations in such a special case, replacing them by an appropriate "practical" boundary condition. In self-energy calculations one sometimes uses a different type of "photon vacuum" condition. Such approximation gives correct results up to second but not to fourth powers of e. (auth)

1057
THE ENERGY DENSITY TENSOR IN GAUGE-INDEPENDENT QUANTUM ELECTRODYNAMICS. Frederik J. Belinfante. Phys. Rev. 84, 648-53(1951) Nov. 15.

In Heisenberg representation two different definitions of an energy density tensor are given for gauge-independent quantum electrodynamics. Both tensors lead to the same total energy and momentum, if we assume the interaction to vanish at $t = -\infty$. They both satisfy conservation laws. The tensor character of the first one is proved, and the tensor character of the second one is manifest. The first tensor is obtained by analogy with the result of a derivation of the energy density tensor as source of the gravitational field from general-relativistic considerations in manifestly covariant quantum electrodynamics, with subsequent omission of the "phantom terms" containing the redundant variables of this theory. The second tensor has the advantage of admitting a simple covariant subtraction of its vacuum value, and of simplifying even further by use of the new covariant auxiliary condition proposed recently by the author. Its disadvantage, though, is the impossibility of direct physical interpretation, as it is not expressed in terms of field variables in Heisenberg representation. The inconclusiveness of an argument for possible equality of the two tensors is discussed. Both tensors contain the usual self-interaction effects, and the problem is posed of how to eliminate these effects. (auth)

1058
REVERSIBILITY OF QUANTUM ELECTRODYNAMICS. Satosi Watanabe. Phys. Rev. 84, 1008-25(1951) Dec. 1.

The aim of this paper is to re-establish the reversibility of classical electrodynamics in terms of the "expectation values" given by quantum electrodynamics. The reversibility requirement combined with the charge conjugation necessitates that charged fields should obey certain types of statistics. However, the reversibility requirement as such does not determine the statistics, showing that it is the requirement of charge-invariance that has the power to determine the statistics of charged fields. A new interpretation will be given to the old problem concerning the conflict of electromagnetic reversibility vs. "retarded" potential. Four different kinds of tensors, four different kinds of spinors (pseudospinors), bi-spinors (eight-component spinors) and bi-tensors are introduced as useful representation vectors of the entire congruent group including spatial and temporal inversions. (auth)

1059
A CANONICAL TRANSFORMATION IN THE THEORY OF PARTICLES OF ARBITRARY SPIN. W. A. Hepner. Phys. Rev. 84, 744-9(1951) Nov. 15.

Canonical transformation between the β-operators and certain components of the spin-tensor yields explicit expressions for the latter. The transformation is used to deduce general consequences that simplify the derivation of commutation relations. It can also be applied with advantage to construct free particle solutions of the wave equation. (auth)

1060
REMARKS ON THE MASS DEFECT OF THE HYDROGEN ATOM. Mario Bunge. Acta Phys. Aust. 5, 77-9(1951) Nov. (In German)

The relativistic wave equation is shown to be inadequate to describe a Lorentz reference system in arbitrary motion, but a quantum mechanical description is possible if the electromagnetic potential is taken into account. General energy expressions are derived by tensor calculus for the H atom, consideration being given to the self-energies of proton and electron.

1061
A RATIONAL FORMULATION OF THE THEORY OF SPIN-1 CORPUSCLES WITH REGARD TO A THEORY OF MESONS AND NUCLEAR FORCES. Bernard Kwal. J. phys. radium 12, 868-72(1951) Nov. (In French)

The usual theories of spin-1 particles are based on a confusion between the ideas of potentials and fields. It is possible to introduce true potentials having the fundamental and distinctive property of gage transformation. These true potentials are those which figure in the Lagrange-Hamilton formulation as independent canonical variables. A rational formulation of the theory of Maxwellian C_1^1, de Broglian C_0^1, pseudo-Maxwellian C'^1_1, and pseudo-de Broglian C'^1_0 particles is attained. The true potentials admit only the same singularity (in r^1) as that which characterizes the potential vector in the Maxwell-Lorentz theory; stationary solutions of Dirac's equations are found for a particle in a meson interaction field derived from these potentials.

1062
THEOREM ON THE INVARIANT FORMS OF FOUR DIRAC WAVE FUNCTIONS. APPLICATION TO NUCLEON-NUCLEON SCATTERING CROSS SECTION. Louis Michel. J. phys. radium 12, 793-804(1951) Oct. (In French)

It is well known that with 4 Dirac wave functions, taken in a given order, it is possible to form 5 linearly independent scalars, 8 vectors, 9 antisymmetric tensors of the second order, 8 pseudovectors, or 5 pseudoscalars. Permutation of the ψ functions of one of these invariants gives a new invariant which is a linear combination of the old, but of the same type. The theorem may be applied to calculations. For example, all the S-matrix elements of an event involving only 4 real fermions include the invariants considered, and the exchange forces arise as ψ permutations. The cross section of nucleon-nucleon scattering is calculated. The theorem is extended to 35 scalars and 35 pseudoscalars formed with 6 ψ functions.

1063
A NEW FAMILY OF APPROXIMATE SOLUTIONS FOR CERTAIN NON-SEPARABLE SCHROEDINGER EQUATIONS. APPLICATION TO THE GROUND STATE OF HELIUM. P. Pluvinage. J. phys. radium 12, 789-92(1951) Oct. (In French)

Approximate solutions for the Schroedinger equation of two-electron atoms are derived. Application to the ground state of He gave the energy eigenvalues to within 0.13% and the ionization potential to within 0.45% of the true values. The method is applicable when the ordinary theory of perturbations fails.

1064
CALCULATION OF FINAL STATE OF NUCLEI FROM CALCULATIONS OF COEFFICIENT OF INTERNAL CONVERSION. L. A. Sliv. Zhur. Eksptl'. i Teoret. Fiz. 21, No. 7, 770-4(1951) July. (In Russian)

Wave functions for various magnetic multipole transitions are derived and related to the coefficient of internal conversion for heavy nuclei.

AUTHOR INDEX

For each reference the digit preceding the dash is the volume number and digits after the dash are the abstract number.

AUTHOR INDEX

NUMERICAL INDEX OF REPORTS

Numerical Index of Official Atomic Energy Reports with Indications of Their Availability

This list in the individual issues of Volume 6 supplements the Numerical Index of Reports with Indications of Their Availability which appears in NSA, Volume 5, No. 24. As reports are in manuscript form when abstracted for NSA, there may be some delay before the reports will be available at the Depository Libraries. The notation NSA in the Availability column indicates the appearance of a report in its entirety in NSA.

Abbreviations used below are:

NSA - NUCLEAR SCIENCE ABSTRACTS
ADD - ABSTRACTS OF DECLASSIFIED DOCUMENTS the predecessor of NSA
NNES - National Nuclear Energy Series, published by the McGraw-Hill Book Company

Code designations are assigned as follows:

MDDC - To declassified reports released by the Manhattan Engineer District and by the Atomic Energy Commission before March 1, 1948
AECD - To declassified reports released by the Atomic Energy Commission after February 29, 1948 (appeared in April 15, Nuclear Science Abstracts)
AECU - To unclassified reports originating within the Atomic Energy Project. (Subsequent to AECU-871, this code is applied only to reports carrying no other recognized code designation.)

Other code designations below are assigned to unclassified reports by the originating installations

Report	Abstract	Availability
AECD-3060	NSA-5-2767	J. Electrochem. Soc. 98, 505-9(1951)
AECU-475	3-1865	J. Am. Chem. Soc. 73, 2442-7(1951)
676	4-1659	Anat. Record 105, 575(1949)
681	4-1618	Genetics 35, 135(1950)
691	4-1619	Genetics 35, 135(1950)
750	4-3636	Am. J. Physiol. 162, 590-7(1950)
881	4-5691	Phys. Rev. 80, 611-15(1950)
888	4-5557	Am. Naturalist 84, 477-88(1950)
899	4-5693	Phys. Rev. 80, 995-1005(1950)
908	4-5718	Anal. Chem. 23, 1056(1951)
909	4-5637	Anal. Chem. 23, 545(1951)
957	4-6746	Phys. Rev. 79, 539-40(1950)
961	4-6736	Phys. Rev. 80, 157-63(1950)
962	4-6737	Phys. Rev. 80, 619-24(1950)
965	4-6713	J. Chem. Phys. 18, 1587-92(1950)
983	5-1108	Phys. Rev. 82, 703-9(1951)
985	5-1471	Nucleonics 7, No. 5, 39-45(1950)
988	5-1880	Rev. Sci. Instruments 21, 1026(1950)
1030	5-1369	Phys. Rev. 82, 190-3(1951)
1048	5-2599	Phys. Rev. 82, 344(1951)
1049	5-1370	Phys. Rev. 82, 344(1951)
1050	5-1388	Phys. Rev. 82, 332(1951)
1051	5-1307	Phys. Rev. 82, 345(1951)
1052	5-1371	Phys. Rev. 82, 345(1951)
1053	5-1960	Phys. Rev. 82, 305(1951)
1054	5-1338	Phys. Rev. 82, 345(1951)
1060	5-1124	Phys. Rev. 80, 481-2(1950)
1064	5-1952	Phys. Rev. 81, 305(1951)
1065	5-1372	Phys. Rev. 81, 326(1951)
1066	5-1308	Phys. Rev. 81, 323(1951)
1067	5-1135	Phys. Rev. 81, 300(1951)
1070	5-1373	Phys. Rev. 81, 326(1951)
1071	5-881	Phys. Rev. 81, 326(1951)
1074	5-1295	Phys. Rev. 81, 326(1951)
1075	5-1125	Phys. Rev. 80, 921(1950)
1080	5-1293	Phys. Rev. 80, 473(1950)
1081	5-910	Am. J. Physiol. 163, 709(1950)
1083	5-939	RA-DET 3, 14(1950)
1084	5-2663	J. Bact. 61, 305(1951)
1088	5-2267	Phys. Rev. 82, 334(1951)
1089	5-1938	Physics Today 4, 6-11(1951)
1093	5-1896	Phys. Rev. 82, 317(1951)
AECU-1094	NSA-5-1897	Phys. Rev. 82, 317(1951)
1095	5-1866	Phys. Rev. 82, 306(1951)
1111	5-2923	Rev. Sci. Instruments 22, 569-71(1951)
1131	5-2664	Federation Proc. 10, 189(1951)
1144	5-2642	Bact. Proc., 54(1951)
1145	5-2643	Bact. Proc., 33-4(1951)
1148	5-3246	Phys. Rev. 81, 325(1951)
1149	5-2610	Phys. Rev. 82, 688-90(1951)
1150	5-3188	Nucleonics 7, No. 6, 73(1950)
1153	5-2611	Phys. Rev. 83, 223(1951)
1165	5-2983	Am. Naturalist 85, 81-96(1951)
1175	5-4102	J. Applied Phys. 22, 797-805(1951)
1181	5-3247	Phys. Rev. 82, 295(1951)
1182	5-3442	Phys. Rev. 81, 155(1951)
1184	5-3093	Nucleonics 7, No. 6, 74(1950)
1196	5-2880	Phys. Rev. 83, 235(1951)
1214	5-3227	Phys. Rev. 83, 234(1951)
1215	5-3500	Phys. Rev. 83, 234(1951)
1216	5-3266	Phys. Rev. 83, 215(1951)
1217	5-3544	Phys. Rev. 83, 216(1951)
1218	5-3488	Phys. Rev. 83, 233(1951)
1303	5-4067	Proc. Soc. Exptl. Biol. Med. 78, 123-53(1951)
1333	5-4120	J. Am. Chem. Soc. 73, 5524-5(1951)
1307	5-4096	J. Biol. Chem. 22, 769-805(1951)
1347	5-4083	Anal. Chem. 23, 1730-5(1951)
1360	5-5303	Phys. Rev. 84, 869-76(1951)
1440	5-5292	Rev. Sci. Instruments 22, 838-9(1951)
1441	5-5398	Phys. Rev. 84, 902-5(1951)
1477	5-5371	Phys. Rev. 84, 991-3(1951)
1553	5-5309	Rev. Sci. Instruments 22, 841(1951)
1615	5-6487	Phys. Rev. 84, 1056(1951)
1629	5-6277	Rev. Sci. Instruments 22, 841-2(1951)
1635	5-6397	Phys. Rev. 84, 969-72(1951)
1666	5-6905	Phys. Rev. 84, 1065-6(1951)
CUD-60	5-6913	Rev. Sci. Instruments 22, 837-8(1951)
ISC-177	5-6908	Phys. Rev. 84, 1059-60(1951)
NP-1424	4-5186	Anal. Chem. 23, 1865-6(1951)
NYO-3029	5-7283	Phys. Rev. 84, 1070-1(1951)
ORNL-755	5-3074	Anal. Chem. 23, 1859-60(1951)
831	5-3362	Anal. Chem. 23, 1713(1951)

NEW NUCLEAR DATA

Summary of New Nuclear Data on Half Lives, Radiations, Relative Isotopic Abundances, Nuclear Moments, Neutron Cross Sections, Reaction Energies, and Masses

Prepared by National Bureau of Standards Nuclear Data Group with the Assistance of Readers

For a list of the abbreviations used in this section, see NSA, Vol. 6, No. 1, page "SUPPLEMENT 1".

H	σ_t(14 Mev) 0.68		L. S. Goodman, ANL-4602 (Mar. 1951).
	σ_t(14.2 Mev) 0.68		D. I. Meyer and W. Nyer, LA-1279 (July 1951).
	σ_t(14.1 Mev) 0.689		H. L. Poss et al., BNL-117 (June 1951).
	σ_t(156 Mev) 0.046		A. E. Taylor et al., Phil. Mag. 42, 751(1951).
$_1H_1^2$	σ_t(14.2 Mev) 0.81		D. I. Meyer and W. Nyer, LA-1279 (July 1951).
	σ_t(156 Mev) 0.0707		A. E. Taylor et al., Phil. Mag. 42, 751(1951).
$_3Li_5^8$	β^- ~2% <13 to 4.8 level of Be^8?	$a\beta\gamma$	G. Vendryes, Compt. rend. 233, 391(1951).
$_5B_7^{12}$	β^- 4% ~9.1	$a\beta\gamma$	G. Vendryes, Compt. rend. 233, 391(1951).
C	σ_t(14 Mev) 1.14		L. S. Goodman, ANL-4602 (Mar. 1951).
	σ_t(14.2 Mev) 1.29		D. I. Meyer and W. Nyer, LA-1279 (July 1951).
	σ_t(14.1 Mev) 1.279		H. L. Poss et al., BNL-117 (June 1951).
	σ_t(156 Mev) 0.330		A. E. Taylor et al., Phil. Mag. 42, 751(1951).
N	σ_t(14.2 Mev) 1.39		D. I. Meyer and W. Nyer, LA-1279 (July 1951).
O	σ_t(14 Mev) 1.49		L. S. Goodman, ANL-4602 (Mar. 1951).
	σ_t(14.2 Mev) 1.61		D. I. Meyer and W. Nyer, LA-1279 (July 1951).
	σ_t(156 Mev) 0.430		A. E. Taylor et al., Phil. Mag. 42, 751(1951).
Al	σ_t(14 Mev) 1.67		L. S. Goodman, ANL-4602 (Mar. 1951).
	σ_t(156 Mev) 0.68		A. E. Taylor et al., Phil. Mag. 42, 751(1951).
Cl	q coupling ratio Cl^{35}/Cl^{37} 1.268 [p-$C_6H_4Cl_2$]		M. Buyle-Bodin and D. Dautreppe, Compt. rend. 233, 1101(1951).
$_{18}A_{24}^{42}$	τ >200^d p 12.4^{h}K		S. Katcoff, BNL-117 (June 1951). A(n).
$_{26}Fe_{26}^{52}$	β^+ ~0.64 a K/β^+ ~1.6 No γ p ≥ 95% 21^mMn		G. Friedlander and J. M. Miller, Phys. Rev. 84, 588(1951).
$_{26}Fe_{29}^{55}$	E_{dis} 0.21 scin From continuous γ endpoint		D. Maeder and P. Preiswerk, Phys. Rev. 84, 595(1951).
$_{29}Cu_{37}^{66}$	τ 5.2^m β^- 9% 1.59 sl 91% 2.63 γ 1.04 sl;ce$^-$ $\alpha < 3 \times 10^{-3}$		G. Friedlander and D. E. Alburger, Phys. Rev. 84, 231(1951). Cu(pile n,γ).
$_{32}Ge_{37}^{69}$	β^+ 2% 0.220 sl 10% 0.610 88% 1.215 γ 0.090 sl;pe$^-$ 0.388 1.120* 0.576* 1.340 0.870* 1.610 (1.215β)γ coincidences		C. M. Huddleston and A. B. Smith, Phys. Rev. 84, 289(1951). Ga(d,2n). *Relative intensities 44, 29, 100.
$_{33}As_{42}^{75}$	μ 1.4351 I [Based on $\mu(H^1)$ = 2.7934]		S. S. Dharmatti and H. E. Weaver, Jr., Phys. Rev. 84, 367(1951).
$_{37}Rb_{51}^{88}$	β^- ~65% 5.2 a ~16% 3.6 $a\beta\gamma$ ~19% 1.8 $a\beta\gamma$ γ 1* 3.0 a;pe$^-$ 10* 1.7		K. Geiger, Ann. Physik 9, 293(1951). No (5.2β^-,γ). $\beta\gamma$, $\gamma\gamma$. *Relative intensities.
$_{38}Sr_{49}^{87}$ 2.75^h	τ 2.80^h γ 0.390 sl;ce$^-$ α_K = 0.28 K/L + M = 6.9 e$^-$X coincidences only		L. G. Mann and P. Axel, Phys. Rev. 84, 221(1951). d 80^{h}Y.
$_{39}Y_{48}^{87}$ 80^h	τ 80.0^h β^+ 0.3% ~0.7 sl γ 0.485 sl;ce$^-$ α_K = 0.0032 γX coincidences		L. G. Mann and P. Axel, Phys. Rev. 84, 221(1951). Sr(10 Mev d,n); chem.

$_{39}Y^{87}_{49}$ 14^h	τ	14^h		L. G. Mann and P. Axel, Phys. Rev. 84, 221(1951). Sr(10 Mev d,n); chem.
	γ	0.384	sl;ce⁻	
		$\alpha_K = 0.24$		
	e-X coincidences			
	No γ's with $E_\gamma > 1$			
$_{41}Nb^{92}_{51}$	γ weak	0.20	scin	G. E. Boyd, ORNL-1053 (Mar. 1951). Mo(d,α).
		0.91		
		follows K		
$_{41}Nb^{90}_{49}$	γ	0.14	scin	G. E. Boyd, ORNL-1053 (Mar. 1951). Mo(d,α).
		1.14		
		2.23		
$_{43}Tc^{95}_{52}$ 20.0^h	γ	0.76	scin	G. E. Boyd and B. H. Ketelle, ORNL-1053 (Mar. 1951). Mo(d).
		1.07		
	0.93γ not found			
$_{49}In^{111}_{62}$	μ(0.247 level)		$\gamma\gamma(\theta)$	H. Aeppli et al., Phys. Rev. 84, 370(1951).
		−0.85		
$_{49}In^{113}_{64}$ 1.73^h	γ	0.3933	sπ;ce⁻	J. M. Cork et al., Phys. Rev. 84, 596(1951).
$_{50}Sn^{113}_{63}$ 112^d	τ	118^d		J. M. Cork et al., Phys. Rev. 84, 596(1951). Sn^{112}(pile n).
	γ	0.2552	sπ;ce⁻	
		0.4009		
$_{50}Sn^{117}_{67}$ 14.5^d	τ	14.0^d		J. M. Cork et al., Phys. Rev. 84, 596(1951). Sn^{115}(pile n).
	γ	0.1559	sπ;ce⁻	
		K/L ~ 7		
		0.1594		
$_{50}Sn^{123}_{73}$ 130^d	τ	125^d		J. M. Cork et al., Phys. Rev. 84, 596(1951).
	No 0.394γ		sπ	
$_{50}Sn^{127}_{77}$	τ	1.5^h		J. W. Barnes and A. J. Freedman, Phys. Rev. 84, 365(1951). Fission.
	p 93^hSb, 9.3^hTe			
$_{51}Sb^{126}_{75}$	τ	9^h		J. W. Barnes and A. J. Freedman, Phys. Rev. 84, 365(1951). Fission. Assignment from yield.
	β^-	1	a	
	γ	0.4	a,scin	
		0.90		
	$\beta\gamma\gamma$ coincidences			
$_{52}Te^{121}_{69}$ 143^d	τ	140^d		J. M. Cork et al., Phys. Rev. 84, 596(1951). Te^{120}(pile n).
	γ	0.0818	sπ;ce⁻	
		0.2136		
$_{52}Te^{121}_{69}$ 17^d	γ	0.575	sπ;ce⁻	
$_{52}Te^{123}_{71}$ $\sim 100^d$	τ	121^d		J. M. Cork et al., Phys. Rev. 84, 596(1951). Te^{122}(pile n).
	γ	0.0887	sπ;ce⁻	
		0.1592		
$_{52}Te^{123}_{71}$ $\sim 100^d$	γ <0.5%	(0.284)	scin	B. Hamermesh and V. Hummel, Phys. Rev. 84, 381(1951).
$_{52}Te^{125}_{73}$ 58^d	γ	0.0353	sπ;ce⁻	J. M. Cork et al., Phys. Rev. 84, 596(1951). Te^{124}(pile n).
		0.1096		
$_{52}Te^{127}_{75}$ 90^d	τ	115^d		J. M. Cork et al., Phys. Rev. 84, 596(1951). Te^{126}(pile n).
	γ	0.0887	sπ;ce⁻	
$_{52}Te^{129}_{77}$ 32^d	τ	33.5^d		J. M. Cork et al., Phys. Rev. 84, 596(1951). Te^{128}(pile n).
	γ	0.1060	sπ;ce⁻	
$_{53}I^{131}_{78}$	β_1	0.250	sl; $\beta\gamma$	B. H. Ketelle et al., Phys. Rev. 84, 585(1951).
	β_2	0.335		
	β_3	0.606		
	γ_1	0.080	scin	
	γ_2 9.4%	0.284		
	γ_3 80.0%	0.364		
	γ_4 7.7%	0.635		
	γ_5 0.6%	0.163		
	γ_6 2.3%	0.720		
	$\beta_1\gamma_6, \beta_2\gamma_4, \beta_3\gamma_2, \beta_3\gamma_3, e_1^-\gamma_2$			
	γ	(0.080)	sl;ce⁻	R. L. Graham and R. E. Bell, Phys. Rev. 84, 380(1951).
		$\tau = 5 \times 10^{-10}$s		
		(0.364)		
		$\tau < 10^{-10}$s		
$_{55}Cs^{134}_{79}$	$\gamma\gamma(\theta)$ consistent with I = 5,4,2,0			B. L. Robinson and L. Madansky, Phys. Rev. 84, 604(1951).
$_{56}Ba^{133}_{77}$ 38.9^h	γ	0.012	pc	R. D. Hill et al., Phys. Rev. 84, 382(1951). Cs(15 Mev d,2n); chem.
		$\alpha_{L+M} \sim 130$		
		$\tau < 5 \times 10^{-7}$s		
	(0.275 γ)(0.012 γ)			
$_{73}Ta^{180}_{107}$	τ	8.0^h		A. J. Moses and D. S. Martin, Jr., Phys. Rev. 84, 366(1951).
	β^-	0.7	a	
	W^{182}(≤30 Mev γ,pn); chem.			
$_{73}Ta^{183?}_{110}$	τ	6.0^d		A. J. Moses and D. S. Martin, Jr., Phys. Rev. 84, 366(1951).
	β^-	0.6	a	
	W(≤30 Mev γ); chem.			
$_{73}Ta^{185}_{112}$	τ	48^m		A. J. Moses and D. S. Martin, Jr., Phys. Rev. 84, 366(1951). W(≤30 Mev γ); chem.
	β^-,e^-?	0.15	a	
	β^-	1.6	a	
	No $\beta\beta$ for delay $<10^{\mu s}$			
$_{74}W^{180}_{106}$	σ(th n,γ)140^dW			M. Lindner, Phys. Rev. 84, 240(1951).
	≈2			
$_{74}W^{181}_{107}$	τ	~120^dW		M. Lindner, Phys. Rev. 84, 240(1951). W(n,γ).
	X-rays, hard γ's			
$_{74}W^{187}_{113}$	σ(th n,γ)65^d			M. Lindner, Phys. Rev. 84, 240(1951).
	~80			
$_{75}Re^{189?}_{114}$	$\tau(\sim 0.2\beta^-)$ ~150^dW			M. Lindner, Phys. Rev. 84, 240(1951). Re(th n,γ); chem.
	$\tau(\sim 0.75\beta^-)$ >5^y			
$_{76}Os^{193}_{117}$	σ(th n,γ)700^dOs			M. Lindner, Phys. Rev. 84, 240(1951). [*Assuming $\sigma(Os^{192})$ = 1.6 instead of 5.3.]
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AVAILABILITY OF AEC RESEARCH AND DEVELOPMENT REPORTS

The Reports Reference List indicates the declassified and unclassified research reports which are abstracted in this issue of Nuclear Science Abstracts.

Many of these reports are or will be published in the scientific and technical journals or in volumes of the National Nuclear Energy Series. Upon publication, the report is listed in the supplements to the Numerical Index of Reports, found in the back of each issue of Nuclear Science Abstracts.

Reports not intended for publication are sent to the AEC depository libraries listed below as soon as possible after being abstracted. (Some of this group are also for sale by the Office of Technical Services, Department of Commerce, Washington 25, D. C., which will send price lists upon request.)

HOW TO LOCATE AEC REPORTS

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